September 1961

Electrical South

a W.R.C. Smith publication

Effective [illegible] installation helps to create illusion of spaciousness in small apartment

In this issue:

Actual trial report: Cable tracer performs its job well

Design for a heat load analyzing meter panel

Utility engineering section begins on page 55

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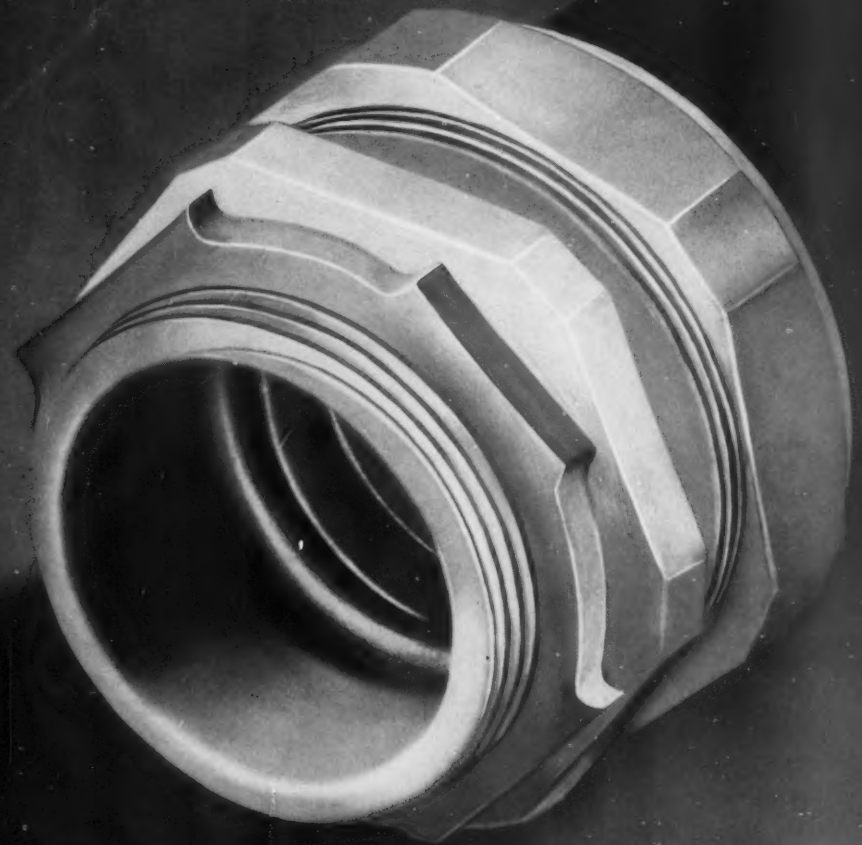

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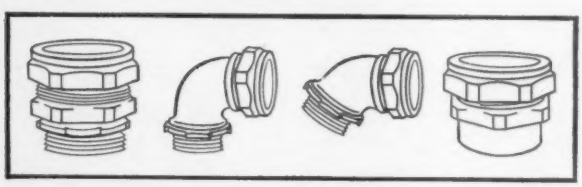

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FRONT COVER—Lighting has created the visual effect of larger space in this one-room apartment. Next month ES places special emphasis on lighting and describes this and other significant installations of fixtures, wiring, and related equipment, as well as some important new lighting products.

Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

Problems of farm labor

One of the most interesting problems in the economy is the continued decline of agricultural labor at a time when farm production continues to increase.

This is not a trend that has begun in the past few years but reaches back through several decades. Moreover, it has created considerable discussion among governmental leaders who are continually searching for a solution to the problem of the poor farmer. These solutions have usually been directed toward some technique for the control of the supply of farm products that enter the American market.

There has been a succession of crop controls, restricted acreage, quotas for marketing, and payments for potential crops that have not been planted. In spite of all these devices, however, the quantity of farm produce turned out by American farmers continues to increase and to plague well-meaning lawmakers who see no possible solution unless crops are restricted.

It seems like peculiar economics when this land of plenty is so overly abundant that it is necessary to restrict, destroy, or store in perpetuity farm products that some citizens cannot even afford to buy. There are many Americans who actually are in need of foodstuffs and yet, because of low income or depressed circumstances, cannot afford to buy.

This situation is echoed all over the world and undoubtedly much of the international political turbulence would be limited if peoples could have enough food for themselves and family. However, what we do with excess production is only one partial solution to the farm problem and is only temporary at best.

Agricultural employment

For many years there has been a net outflow of farm people to urban pursuits, thus indicating that many have given up hope of earning a sound living from the soil. Many of these have taken industrial jobs and are to be found in all types of factories and plants in all of the large city areas. Such people often present a strong stabilizing influence upon labor problems, for they are accustomed, from farm days, to a full day's work.

Young people born and raised in farm environments often go through college and, through the new occupational and professional vistas opened to them by the educational experience, become professional people, business managers, teachers, and the like. Often they do not return to the farms of their youth. They, too, throw themselves into their new occupational choices with enthusiasm and real personal effort.

And then there are others who drift into and out of farm employment according to season and according to weather conditions that control the success of growing seasons and the consequent demand for their services. These latter persons are too numerous to count with any degree of accuracy.

Size of the decline

There are many estimates of the size of the decline of farm population on a national basis. In broad general terms, there is a natural farm population increase annually of between 300,000 and 400,000 people per year. Thus, if there were no exodus of farm people to urban environments there soon would be far too many farm workers for the available land.

However, for the past decade or so farm population on the whole has declined on an annual basis by about 500,000 persons. Thus, when these two figures are added, as they must be to get the proper total outflow of farm population, it is quickly noted that almost 1,000,000 persons leave agriculture for non-agricultural pursuits every year. Even so, in 1961, there is a national farm population of approximately 16,500,000 persons.

It is an established fact that one farm worker can supply a far greater number of people today with agricultural produce than was possible a scant decade ago.

When compared with 20 or 30 years ago, this increase is even more astonishing. This increase in farm worker productivity has been caused by many factors, including the increased mechanization of farms, the increased size of farms, the increased development of new farming techniques, and the increased technology of food processing that has enabled produce to be stored in a semi-finished state for periods of consumption outside of the normal growing period.

It would be extremely foolish to suggest, as a solution to the farm problem, that inventive genius and new knowledge should be restricted in order to curtail the production of excess crops, and based upon the experience of the past few decades (and various congressional measures of differing philosophies) that crop controls will solve the dilemma of farm income.

It would appear that some program aimed at limiting the number of farm workers might well offer more advantages than either of the above-mentioned techniques. It has been indicated previously that this has been a natural pattern for the past ten years and, with conditions unchanged, it should continue to be evident on into the future.

The difficulty is, however, that the current pace of farm labor defections is not great enough to keep pace with the development of agricultural techniques and thus the returns to farm labor continue to be less than the returns to other types of employment. A great deal of research needs to be done in this field if an equitable program is to be developed.

Yet such would undoubtedly produce better results, and longer-lasting ones, than the efforts of Congress have to date.

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

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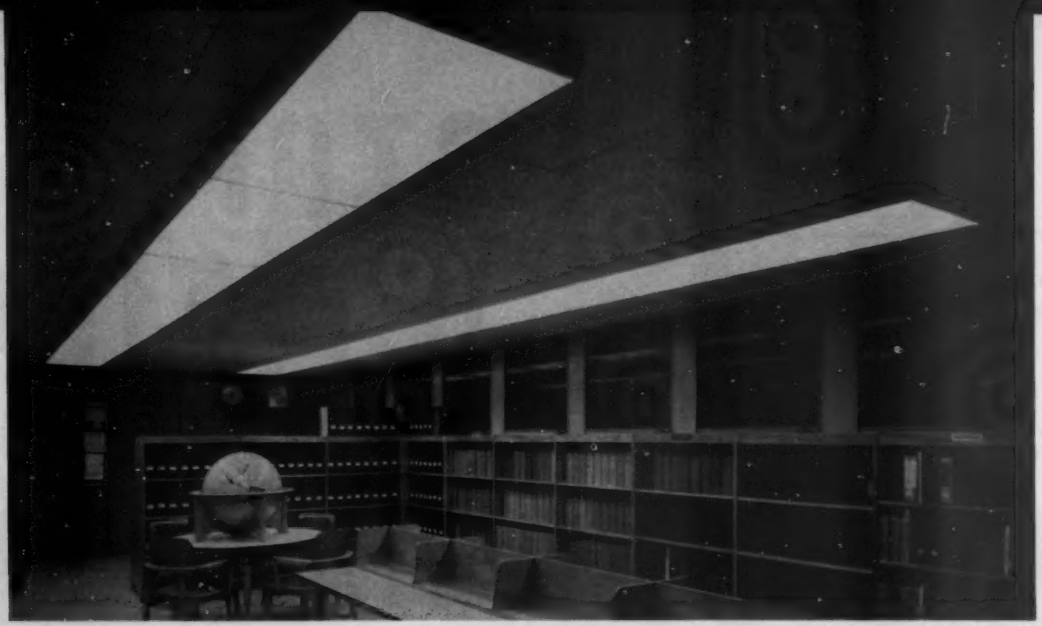

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The ceiling of the library's main reading room slopes from a height of 22 feet at the center down to 14 feet at the walls. DAYLUME® surface mounted elements maintain 85 to 90 footcandles at reading level.

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Washington report

By Jack James

Digest of Washington news of special significance to the electrical industry

New construction value advances five per cent

TOTAL SPENDING for new construction in July was five per cent above the level for July 1960, the U.S. Department of Commerce reports.

Spending for public construction was eight per cent above the July 1960 level and for private construction, four per cent higher. Value of new construction in July was $5.4 billion.

Most encouraging was the fact that during June and July expenditures in private construction held level and expenditures in public construction rose four per cent. Normally private construction drops one per cent between June and July and public construction falls two per cent. In the first seven months of 1961, $31.7 billion had been spent on new construction, $0.8 billion more than in the same period last year.

Housing starts pick up after lagging behind '60

PRIVATE, NON-FARM housing starts that account for about one-third of all new construction began to pick up in June and July after lagging behind the 1960 pace during the first five months of 1961.

The U.S. Department of Commerce said that expenditures on housing were one per cent higher this July than in July 1960.

Monthly the expenditures steadily had increased: $21 billion in May, $22 billion in June, and $23 billion in July. The seasonally adjusted annual rate of housing starts this June was 1,347,000 compared with 1,264,000 in June 1960.

Committees to help solve disputes at missile bases

AT THE FOUR intercontinental ballistic missile bases in the South, government, labor, and management representatives have been appointed to local site committees to help resolve labor disputes.

IBEW representatives are on the committees at two of the bases: G. X. Barker at Cape Canaveral, Fla., and R. C. Duke at Altus, Okla. The other two bases are at Little Rock, Ark., and Abilene, Texas.

Subcontractors at the bases are represented by the general contractors. Similar tri-partite committees have been set up at the 19 ICBM bases outside the South.

Group settles disputes without work stoppages

OVER THESE LOCAL site committees is the national Missile Site Labor Commission.

The commission was set up by President Kennedy following revelations by a Senate committee of costly featherbedding and work stoppages at missile bases. Purpose of the commission is to settle disputes without work stoppages.

First dispute handled was between the IBEW and the Operating Engineers over digging trenches and laying electric lines. A compromise solution proposed joint crews, the engineers to man the machines that dig the trenches and backfill, the electricians to lay the lines.

Also the commission last month suggested policy for contractors and unions to follow in order to provide "uninterrupted and economical operations."

Here are some of the policy recommendations:

"Wages rates, fringe benefits, and other conditions of employment should not be negotiated which establish more costly standards on missile and space site construction than are made applicable to other construction activities in similar circumstances.

". . . It is recognized that some areas may require somewhat higher wages, benefits, and conditions than have prevailed in the past to attract sufficient manpower into an area to perform the missile and space site work.

"The Commission recommends that the parties review . . . agreements . . . to ascertain whether there are provisions which become discriminatory when applied to missile and space sites.

Unauthorized IBEW local strike enters sixth week

BALTIMORE — An unauthorized strike by IBEW Local 28 went into its sixth week while the International decided whether to revoke the local's charter. At issue was the local's refusal to submit its contract dispute with the Maryland Chapter NECA to the IBEW-NECA Council on Industrial Relations.

ATLANTA — The IBEW joined other building trades unions in filing an unfair lock-out charge against the Associated General Contractors. A G C contractors closed down jobs July 1, but reopened July 17.

If the National Labor Relations Board upholds the charge, the contractors might have to reimburse employees for wages lost during the lock-out.

TAMPA—Long lines contractors raised pay for journeymen electricians 25 cents an hour in a one-year contract renewal. The rate is now $3.90 an hour.

RAYNE, LA.—A secondary boycott by IBEW Local 861 against Elco Electric, Inc., was held to be illegal by a trial examiner for the National Labor Relations Board at Washington.

Elco was non-union, the examiner said, and IBEW pickets drove members of other construction unions off jobs on which Elco subcontracted electrical work.

Housing Act offers help to small business firms

A SLIGHTLY PUBLICIZED part of the new Housing Act offers help to small business firms damaged or forced to relocate by federally subsidized construction.

These firms are eligible for loans of up to 20 years at interest rates of 3⅜ per cent. (The interest rates will be reset every June.) The Small Business Administration will make the loans either directly or in participation with banks.

Most urban renewal programs and state highway programs are

(Continued on page 122)

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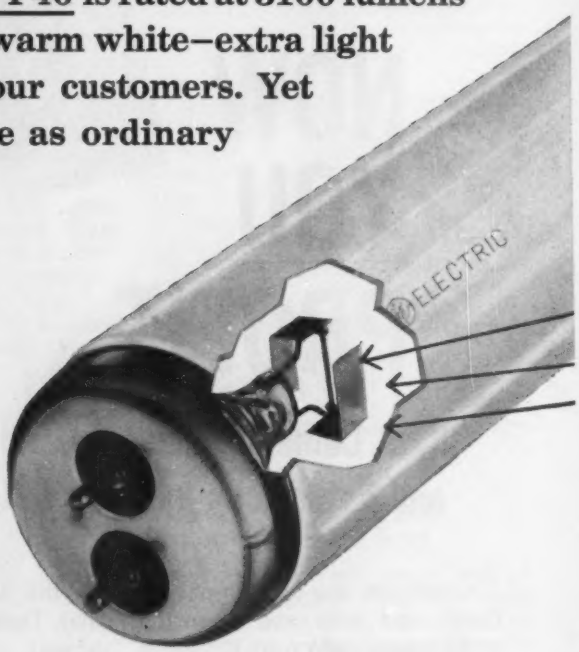
General Electric brightest 40-watt fluorescent ever

Here's money-saving news for 40-watt fluorescent users. General Electric's NEW F40 gives a 7% bonus in light at no extra cost. Now your customers can get their desired lighting level with fewer lamps and fixtures. Or they can increase their existing lighting level without spending a single extra penny for lamps, fixtures or electricity.

Only General Electric offers this bonus in standard 40-watt "white" fluorescent lamps. The G-E NEW F40 is rated at 3100 lumens in popular cool white, 3250 in white or warm white—extra light worth 15¢ to 30¢ a lamp to most of your customers. Yet the list price for this lamp is the same as ordinary fluorescents.



NEW F40 ONLY $1.30 LIST

announces the cool-white made...

The bonus of light your customers get with General Electric's *NEW F40* is made possible because of these G-E Premium 3 construction features:

1. **G-E wattage-miser electrode helps convert power ordinarily lost in the cathode into useful light—free.**
2. **New, more efficient gas mixture.**
3. **New electronically screened bonus-phosphor.**

And all these light producing features are available for the first time in a lamp that sells for the same price as ordinary fluorescents—only $1.30 for the popular cool white, $1.35 for other "white" colors.

Designed for both Rapid Start and starter-type circuits, the *NEW F40* has a life rating of 7500 hours for most circuits (6000 hours for systems installed before 1954). To get 7500-hour life in pre-'54 circuits, F40/54 lamps are available. They give the same light as ordinary 40-watt fluorescents (2900 lumens) and list for the same price ($1.30 in cool white). General Electric Co., Large Lamp Dept. C-122, Nela Park, Cleveland 12, Ohio.

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The Amprobe RS-3* enables you to take voltage, current and resistance readings to help diagnose electrical "ills." It saves you time and effort; it adds to your reputation for ability and service. Here are a few typical applications. Ask your distributor or write today for more details: ■ determine current loads of power equipment ■ make commercial and industrial load surveys ■ identify unmarked motor terminals ■ test for low-voltage conditions ■ check resistance in solenoid coils. *Only $52.50 (slightly higher outside U.S.).

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. . . inhibits white rust formation . . . eliminates flaking of finish . . . has that fine SPANGLEAM appearance.

NEW—*better packaging for easier handling*

. . . bundled in steel strapping in sizes up through 2" . . . shipped on a one-ton rectangular lift for convenient transit by lift truck...cuts handling costs—makes inventory easier.

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Save installation time, get top protection against rust and corrosion with new SPANG Blue Star Galvanized Rigid Steel Conduit. See your nearby SPANG Distributor for complete details and samples.

SPANG Blue Star Conduit is one of the many fine products produced by *National Supply Division, Armco Steel Corporation, Two Gateway Center, Pittsburgh 22, Penna.*

ARMCO National Supply Division

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Sam H. Deane, a 75-year-old pro, pictured left above with Sorgel representative, W. Chester Smith, took out his union card in Bluefield, West Virginia in May of 1915. Sam has been an active electrician ever since. In his experienced opinion, backed up by his fellow workers and his boss, John Potter, president of Diplomat Electric, Inc., Ft. Lauderdale, Florida, Sorgel transformers like this 75 KVA, 3 phase unit, are the finest in the field. Sam says the quiet level of operation, in addition to ease of installation, is one of the big advantages of Sorgel, especially in office, school and hospital buildings. He is an active member of IBEW Local 728 and installed Sorgel Transformers for Diplomat in the newly completed Broward County Court House job, in Ft. Lauderdale.

1/4 KVA
TO
10,000 KVA,
ALL STANDARD
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VOLTAGES
UP TO
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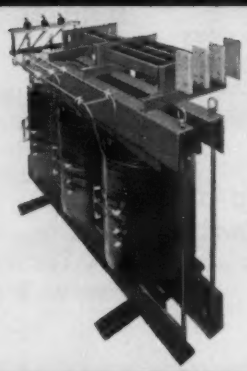


True quality assures you of dependability and low cost operation, and is especially important in the heart of your entire electrical system. This 500 KVA, 5 KV class is a typical Sorgel core and coil unit for a unit sub-station.

Sorgel provides the most liberal designs and a coordinated system of either Class B, F, or H insulation, with the most effective use of quality materials to assure continuity of service. All units meet or exceed ASA, NEMA and AIEE standards. Shown above is a special 25 KVA Globar Furnace Transformer.

A Case History Report...

A FLORIDA ELECTRICIAN WITH 45 YEARS OF EXPERIENCE PREFERS SORGEL FOR 5 REASONS

A professional of 45 years knows his electrical products and these are Mr. Sam Deane's comments on Sorgel dry-type transformers, pointing up the economy and advantages to people like yourself who buy, specify and install transformers.

Fact No. 1—"It's easy to make good tight connections in Sorgel units because the terminations are securely anchored and there is ample hand working room. Another thing, these units aren't squeezed and jammed tightly into the case, which would be dangerous and would slow down installation time."

Fact No. 2—"When we begin installing a Sorgel unit, everything is ready for wiring. Their factory assembly, wiring and testing speed up our whole installation operation."

Fact No. 3—"The case design, location of knockouts, interchangeable wall or floor mounting and the built-in lifting eyes make positioning and securing a breeze for the contractor."

Fact No. 4—"The ventilation design is especially good as it prevents accidental access to live terminal parts. I also like the front cover design because it's easy to remove by means of simple captive bolts."

Fact No. 5—"Last, but not least, you are really proud to have installed a Sorgel unit because of its neat appearance. It definitely is the quietest in the field, never requires maintenance."

Ask your own area electricians and see if they don't agree with this professional of 45 years' experience on the Quiet Quality features of Sorgel units. It's advantages like these that are causing more and more consulting engineers, plant engineers and contractors to specify and insist on Sorgel day in and day out.

Contact your nearest Sorgel Sales Engineer for additional reasons why Sorgel units are truly your most economical buy —as quality pays, it doesn't cost.

SORGEL
SOUND-RATED DRY-TYPE
TRANSFORMERS

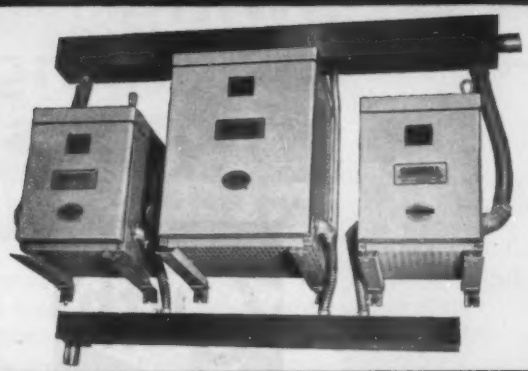
SORGEL ELECTRIC COMPANY

Since 1916 the pioneer in the development, manufacturing and application of sound-rated dry-type transformers

835 WEST NATIONAL AVENUE • MILWAUKEE 4, WIS.

Experienced sales engineers in principal cities

TRANSFORMER FOR YOUR EVERY NEED



Taking full advantage of Sorgel's interchangeable wall and floor mounting design, Diplomat Electric first used the built-in lifting eyes on these Sorgel units to raise them exactly to the selected mounting position nine feet above the floor. This unique bank of one 30 KVA and two 15 KVA units took voltage from a 480Y277 volt primary and provided secondary circuits of 120/240 volt single phase and 240 volt three phase.

CLIP AND MAIL FOR TECHNICAL BULLETINS.

- ☐ 611—Transformer Line
- ☐ 960—Substations
- ☐ 658—DC Saturable Reactors

Name_____

Title_____

Address_____

City_____

State_____

For more details on above items, use reply card on page 21

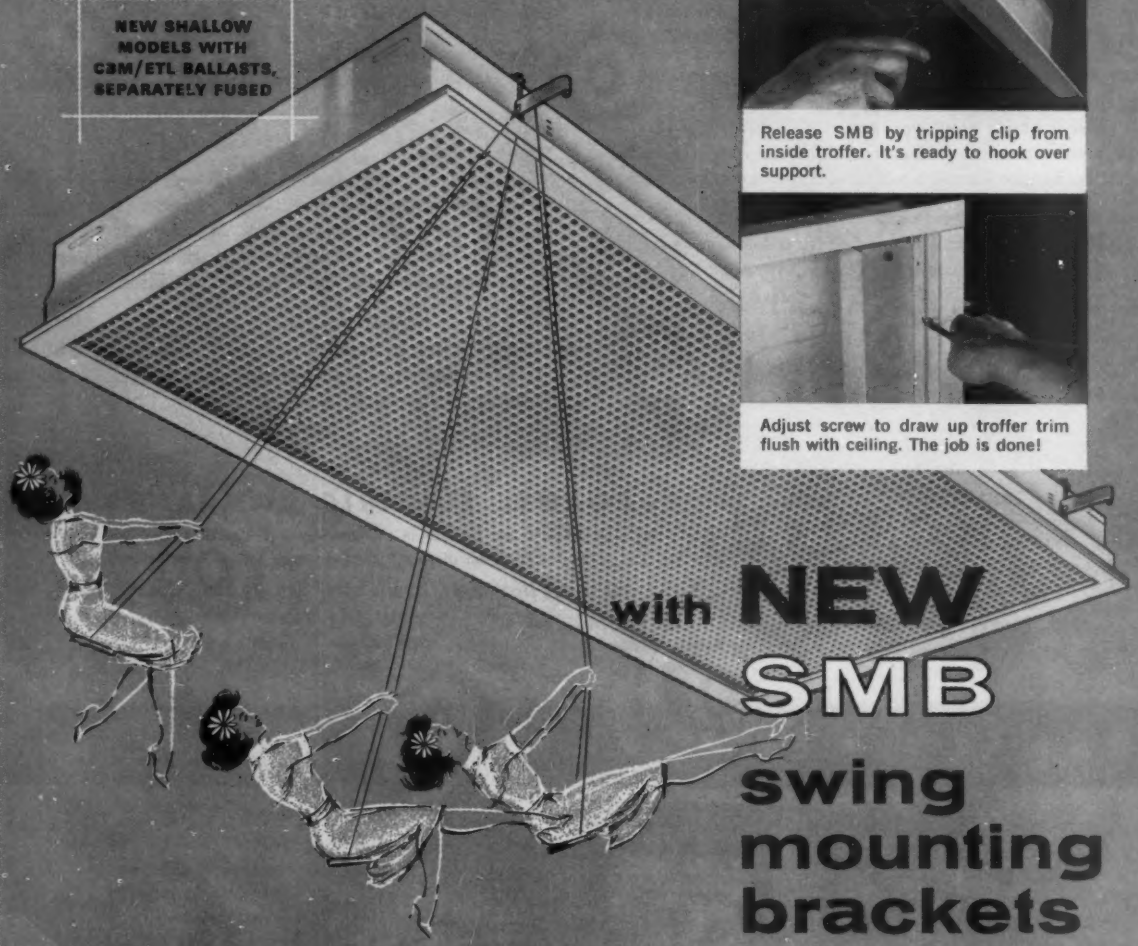
GUTH saves up to 53% on Troffer installation*

NEW SHALLOW MODELS WITH C3M/ETL BALLASTS, SEPARATELY FUSED

Swing Mounting Bracket is preset for height of ceiling support members by adjusting single screw.

Release SMB by tripping clip from inside troffer. It's ready to hook over support.

Adjust screw to draw up troffer trim flush with ceiling. The job is done!



with NEW SMB swing mounting brackets

New Guth Troffers feature Swing Mounting Brackets to simplify installation...**plus** a complete variety to fit most every specification requirement!

New 4¾" shallow models come in 2' and 4' widths. Other units in 6" and 12" widths . . . 2', 4' and 8' lengths. Almost any bottom you can name — including GrateLite Louver Diffuser** and Prismoid GrateLite†. Adaptable to nearly every type of ceiling suspension system.

*These savings do not include wiring and final connections and are based on installation in a plaster or concealed suspension system.

ASK FOR GUTH SMB TROFFER BULLETINS!

THE EDWIN F. GUTH CO. 2615 WASHINGTON BLVD.

** U. S. PAT. NO. 2,743,084 CAN. PAT. NO. 598,948 † U. S. PAT. NO. 2,994,478

Guth
LIGHTING
since 1902

• BOX 7079, ST. LOUIS 77, MO. •

This marker frees one man from tracing cables

The Amprobe Cable Tracer* enables you—by yourself—to trace ten uncoded circuits simultaneously ten times faster than any other method. Simply plug one end of the conductors to be traced into the markers (there are ten of them), the other ends, in pairs, into the pocket-sized Cable Tracer, press the button, and a number lights up to provide unmistakable identification. See your distributor or write today for more details.

Here are some typical, broad category applications:
■ Trace commercial and residential conduit wiring.
■ Identify circuits in intercom and p.a. equipment.
■ Trace multi-conductor cables in control circuits.
■ Correct errors in labeling on panel boxes. ■ Test for opens and shorts. *$39.50 (higher outside U. S.).

AMPROBE INSTRUMENT CORP.
LYNBROOK, NEW YORK
IN CANADA: ATLAS RADIO CORP., 50 WINGOLD AVE., TORONTO

For more details on above items, use reply card on page 21

WEIGHT LOSS DUE TO ATMOSPHERIC CORROSION
after 3100 days exposure.

RESISTANCE TO SOIL CORROSION
13 Soils Ranging from 2.6 pH to 9.4 pH

Time (Years)	CARBON STEEL		YOLOY		WROUGHT IRON	
	Wt. Loss*	Penetration**	Wt. Loss*	Penetration**	Wt. Loss*	Penetration**
2	6.1	52	4.3	41	4.8	48
5.4	11.1	81	7.2	52	8.8	75
9.4	12.1	89	8.5	79	10.9	89
9.5	17.4	88	10.6	79	12.2	97
13.3	19.7	107	11.8	93	16.3	98

*Wt. Loss, oz/ft² **Penetration—mils (Average Max.)

SEA WATER IMMERSION TEST

Material	Days in Test	Wt. Loss Grams	Corr. Rate Mpy	Corr. Rate IPY	Pitting Max.	Pitting Ave.
Mild Steel	2162	1439	36	.007	Perf.	128
Hand Puddled Wrought Iron	2384	1401	32	.006	Perf.	115
Mechanically Puddled Wrought Iron	2384	1247	28	.006	139	80

YOLOY

Exclusively from Youngstown—corrosion resistant steel conduit you can depend on

Hang it in the air. Bury it in the ground. Sink it in the sea. Use Youngstown rigid Yoloy steel conduit in impossible places where corrosion eats other conduit away. Use it because Yoloy lasts.

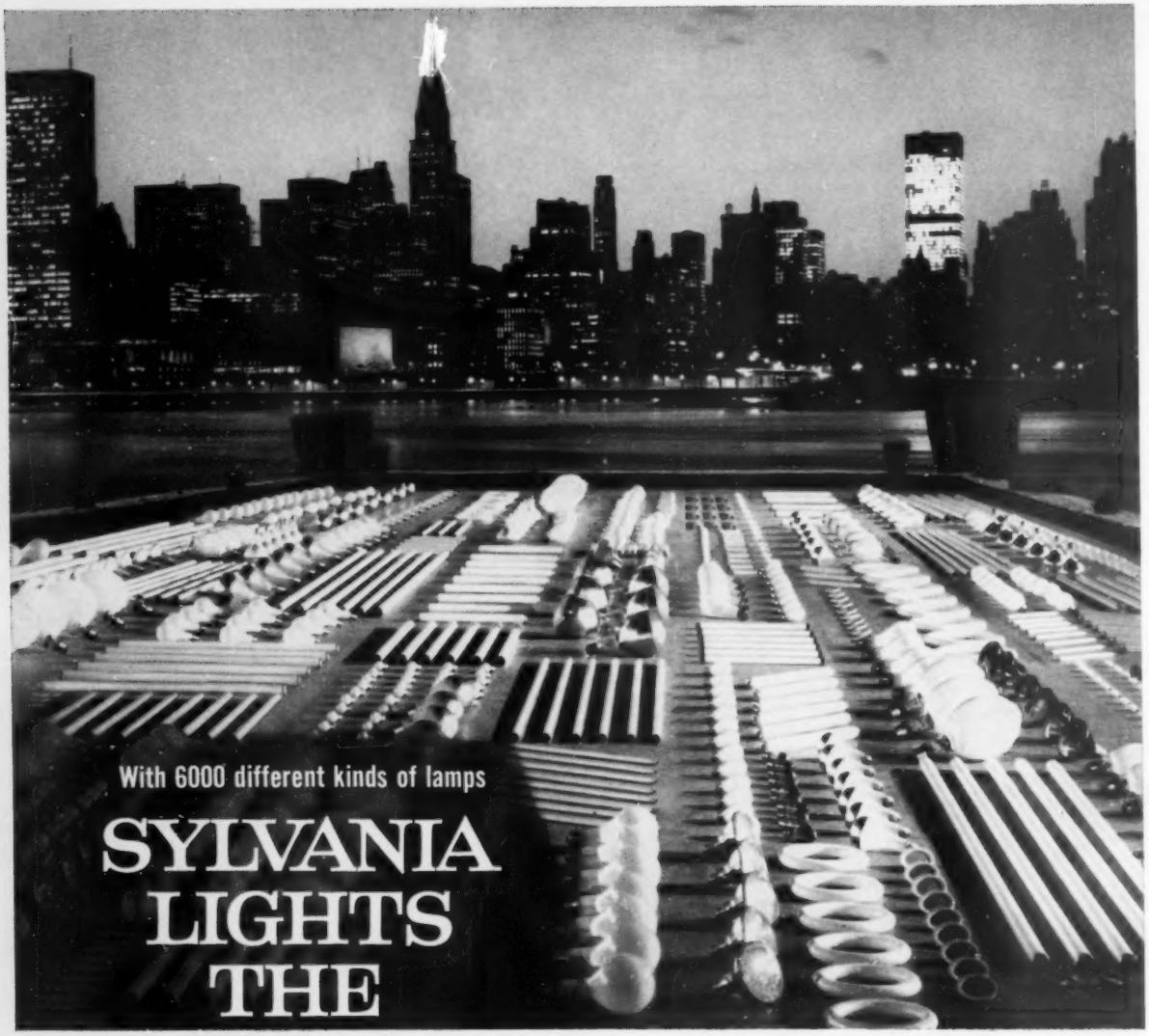
This better, tougher, bendable copper-nickel alloy steel conduit has up to 6 times the corrosion resistance of carbon steel conduit. You can cut, bend, thread, work, install and fish it with ease.

High replacement costs demand a special conduit like Yoloy. Youngstown research created it. Electrical distributors, supplied from Youngstown stocks, will deliver it in the exact quantity, size and kind you need—wherever you need it: ½" to 6" in Hot Dip Galvanized, Black Enameled or EMT.

With Yoloy, you'll get the same uniform high quality that has made Youngstown Buckeye Conduit famous in the industry. Conduit you can depend on. U.L. approved. All from modern Youngstown—largest producer of rigid steel conduit in the world.

Youngstown – growing force in steel

For information about Youngstown Yoloy Steel Conduit, write: Dept. 26B.
The Youngstown Sheet and Tube Company, Youngstown, Ohio



From a world leader in light comes this remarkable stream of new and better ways to light homes, business, the world. Sylvania fluorescents. Incandescents. Mercury lamps. With many dramatic "firsts." In the last few years alone: a VHO (Very High Output) Power-tube that delivers more light than a lighthouse. The first "Natural White" fluorescent to make colors look rich, real, truly lifelike. Are you looking for lamps better than usual? Or unusually different? See Sylvania, where there are 6000 to choose from. And more coming!

SYLVANIA

SUBSIDIARY OF

GENERAL TELEPHONE & ELECTRONICS

GENERAL SYSTEM

Lighting Division, Sylvania Electric Products Inc., Dept. 73, 60 Boston St., Salem, Mass. In Canada: Sylvania Electric (Canada) Ltd., Montreal

INFORMATION CENTER

Help yourself to free literature and more details on any products mentioned in this issue.

Instead of writing a dozen different manufacturers for free literature and more information on products, equipment, or services, just insert on the cards below the appropriate key numbers of the items in which you are interested. These cards may be used to get information on products mentioned in the following departments (see Contents Page for page number):

Catalogs and Bulletins — New Electrical Products
New Utility Equipment — Advertisements

Be sure to print or write legibly your name and address—drop it in the nearest mail box and

ES pays the postage!

SEPTEMBER, 1961

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____

Send this FREE LITERATURE (fill in key numbers):

_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____

Send free information on these ADVERTISEMENTS:

Company..... Page..... Company..... Page.....
Company..... Page..... Company..... Page.....

My Name _____ **Position** _____
My Company's Name _____
Address (number and street) _____
City _____ **Zone** _____ **State** _____

SEPTEMBER, 1961

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____

Send this FREE LITERATURE (fill in key numbers):

_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____

Send free information on these ADVERTISEMENTS:

Company..... Page..... Company..... Page.....
Company..... Page..... Company..... Page.....

My Name _____ **Position** _____
My Company's Name _____
Address (number and street) _____
City _____ **Zone** _____ **State** _____

These cards can help you get valuable information

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South
1760 PEACHTREE ROAD, N. W.
ATLANTA 9, GEORGIA

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

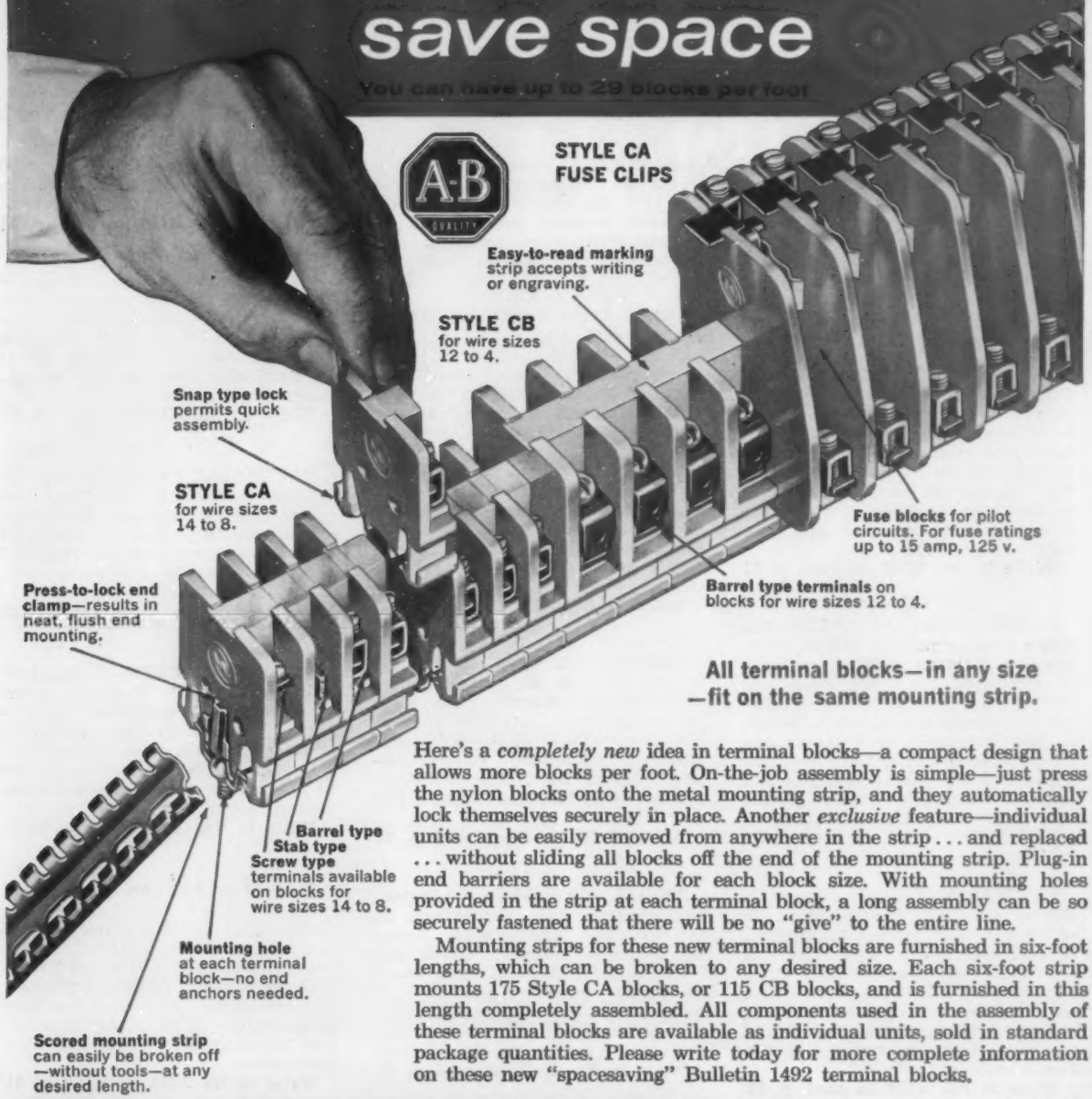
BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South
1760 PEACHTREE ROAD, N. W.
ATLANTA 9, GEORGIA

New ALLEN-BRADLEY BULLETIN 1492 SNAP-ON TERMINAL BLOCKS save space

You can have up to 29 blocks per foot


A-B QUALITY
STYLE CA FUSE CLIPS
Easy-to-read marking strip accepts writing or engraving.
STYLE CB for wire sizes 12 to 4.
Snap type lock permits quick assembly.
STYLE CA for wire sizes 14 to 8.
Fuse blocks for pilot circuits. For fuse ratings up to 15 amp, 125 v.
Barrel type terminals on blocks for wire sizes 12 to 4.
Press-to-lock end clamp—results in neat, flush end mounting.
Barrel type
Stab type
Screw type
terminals available on blocks for wire sizes 14 to 8.
Mounting hole at each terminal block—no end anchors needed.
Scored mounting strip can easily be broken off —without tools—at any desired length.

All terminal blocks—in any size —fit on the same mounting strip.

Here's a *completely new* idea in terminal blocks—a compact design that allows more blocks per foot. On-the-job assembly is simple—just press the nylon blocks onto the metal mounting strip, and they automatically lock themselves securely in place. Another *exclusive* feature—individual units can be easily removed from anywhere in the strip . . . and replaced . . . without sliding all blocks off the end of the mounting strip. Plug-in end barriers are available for each block size. With mounting holes provided in the strip at each terminal block, a long assembly can be so securely fastened that there will be no "give" to the entire line.

Mounting strips for these new terminal blocks are furnished in six-foot lengths, which can be broken to any desired size. Each six-foot strip mounts 175 Style CA blocks, or 115 CB blocks, and is furnished in this length completely assembled. All components used in the assembly of these terminal blocks are available as individual units, sold in standard package quantities. Please write today for more complete information on these new "spacesaving" Bulletin 1492 terminal blocks.

ALLEN-BRADLEY Member of NEMA — **Quality Motor Control**

Allen-Bradley Co., 1305 S. First St., Milwaukee 4, Wis. • In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

CONSULT YOUR LOCAL ALLEN-BRADLEY REPRESENTATIVE

ATLANTA—Roy E. Wilson Co., 1062 Northside Drive, N. W., Tel: TRinity 6-8833
BALTIMORE—H. M. Wood & Co., Inc., 124 Light St., Tel: MUlberry 5-4643
BIRMINGHAM—Allen-Bradley Co., 825 S. 22nd St., Tel: FAirfax 3-1171
CHARLESTON—Henry E. Payne, 918 Kanawha Blvd., E., Tel: Dickens 3-1393
CHARLOTTE—LeRoy P. Spoon, 307 Lincoln St., Tel: EDison 4-6334
DALLAS—John F. Rasco, 2810 McKinney Ave., Tel: TAylor 3-6179
HOUSTON—Allen-Bradley Co., 2105 McKinney Ave., Tel: CApitol 5-0747
JACKSONVILLE—Van & Smith Co., Inc., 1446 June St., Tel: EXbrook 8-0531
KANSAS CITY—Allen-Bradley Co., 1818 Main St., Tel: HArrison 1-4595
KNOXVILLE—Bowditch & Co., 1311-C N. Broadway, P. O. Box 3145, Tel: 4-2513
LITTLE ROCK—Curtis H. Stout, Inc., 400 Shall St., P. O. Box 107, Tel: FRanklin 4-8201
LOUISVILLE—The Rietze Company, 2209 S. Floyd St., Tel: MElrose 7-3603
MEMPHIS—Curtis H. Stout of Tennessee, Inc., 718 M & M Bldg., Tel: JAckson 6-7601
MIAMI—Charles R. Lee & Assoc., Inc., 3796 W. Flagler St., Tel: Highland 4-7414
NEW ORLEANS—Robbins & Robbins, 1037 Magazine St., Tel: JAckson 2-5805
ST. LOUIS—Allen-Bradley Co., 904 N. Grand Blvd., Tel: JEfferson 5-1901
TAMPA—Van & Smith Co., Inc., 4025 Henderson Blvd., Tel: 8-3632
TULSA—John W. Elder Co., 1526 East Fourth St., Tel: Diamond 3-9149

For more details on above items, use reply card on page 21

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

GENERAL CATALOG — General catalog of Royal Electric Corporation, Pawtucket, R. I., covering flexible, service and lamp cords, cord sets, extensions, trouble lights, wiring devices and fuses is available to wholesalers. Dealers catalogs may be secured from Royal distributors.

Write in No. A101 on card, p. 21

WIRING PRODUCTS — Various features of J&S Despard interchangeable wiring devices and detailed information covering this line are offered in a brochure released by Pass & Seymour, Inc., Dept. ES, Syracuse 9, N. Y. Included are such features as Camstrap for quick, easy installation, three-wire grounding, and pressure terminal devices.

Write in No. A102 on card, p. 21

FLUORESCENT BALLASTS—Advance Transformer Co., 2950 N. Western Ave., Chicago 18, Ill., has recently completed the compilation and printing of a 20-page catalog on fluorescent ballasts and their use. Included are data sheets on available Advance ballasts and a comprehensive installation and operation section and testing procedures. Copies of the booklet are available on request.

Write in No. A103 on card, p. 21

ELECTRICAL TAPES — Plymouth Rubber Co., Inc., Canton, Mass., is offering a new catalog on friction, rubber, and plastic tape. The full color folder gives descriptions, sizes, and packing information on their complete line of Slipknot electrical insulating tapes. Detailed specification data charts are included in the 6-page bulletin.

Write in No. A104 on card, p. 21

QUARTZ UNIT—Par Light Manufacturing Co., Milan, Ill., has published a four-page brochure on their new 500-watt—120-volt quartz unit featuring the new incandescent quartz lamp made especially for industry, sports, transportation, and commerce.

Write in No. A105 on card, p. 21

COMMERCIAL FLUORESCENTS —Commercial and industrial fluorescent fixtures are illustrated with complete specifications given in the new loose-leaf catalog from Keystone Electric Manufacturing Co., 2228 East Tioga St., Philadelphia 34, Penn. Shielded and unshielded commercial fixtures, recessed troffers, and industrial fixtures are included.

Write in No. A106 on card, p. 21

GUTH INDUSTRIAL LIGHTING BROCHURE — New 8 page, 4 color brochure by The Edwin F. Guth Company, 2615 Washington Blvd., St. Louis 3, Missouri, describes Guth KOLORKODED industrial lighting fixtures. This unique innovation of color coding luminaires opens a new field in industrial lighting. Folder includes photographs, lighting data, engineering information and complete descriptive data on KOLORKODED luminaires and standard RLM reflector units. Write for your free copy.

Write in No. A107 on card, p. 21

SERVICE PANELS — Information on protective electric control centers for homes, apartment buildings, service stations, and industrial applications is contained in Bulletin PM-385, "BullDog Pushmatic Electric-Centers," issued by BullDog Electric Products Co., 7610 Jos Campau, Detroit, Mich.

Write in No. A108 on card, p. 21

AERIAL CABLES — A 32-page booklet from Olin Conductors, P. O. Box 989, Chattanooga, Tenn., explains how Compresto Cables and PLM Products, "Wrap Around" spacers can be combined in a compact spaced aerial cable system. Design, voltage drop, sag and tension, and short circuit current are also covered.

Write in No. A109 on card, p. 21

FITTINGS AND FIXTURES—Information relative to explosion-proof fittings, fixtures, plugs and receptacles, and accessories is available in a 50-page book illustrating the complete line of these products manufactured by Killark Electric Mfg. Co., Easton and Vandeventer Ave., St. Louis 13, Mo.

Write in No. A110 on card, p. 21

CONDUIT WIREHOLDERS — A new information sheet describing their line of all-purpose conduit wireholders is now available from Knox Porcelain Corp., P. O. Box 2031, Knoxville, Tenn. The illustrated sheet gives installation information, design features, and specifications.

Write in No. A111 on card, p. 21

CONDUIT FITTINGS—A new 24-page catalog, illustrating a complete line of conduit fittings, oval bodies type LB, LL, LR, and T, and lighting parts is now available from Elliott Electric Mfg. Co., 50-30 98th St., Corona, N. Y.

Write in No. A112 on card, p. 21

SATURABLE REACTORS — This efficient method of regulating and controlling electric power for various manufacturing processes is described in a new folder available from Sorgel Electric Co., 838 West National Ave., Milwaukee 4, Wisc.

Write in No. A113 on card, p. 21

POWER SWITCHES—A new bulletin describing its Type PV power switches, is now available from Line Material Industries, Milwaukee 1, Wis. The bulletin gives complete information on switches rated at 600 or 1200 amperes and having voltage ratings from 7.5 kv to 69 kv.

Write in No. A114 on card, p. 21

MOTOR STARTERS—Design and construction features of their automatic reduced voltage starters are described in a new bulletin released by Allis Chalmers, Milwaukee 1, Wis. Included is motor control engineered for centrifugal compressors, hammer mills, pumps, large conveyors, large fans, motor-generator sets, and other applications.

Write in No A115 on card, p. 21

HEAVY-DUTY WIRING—Illustrations and detailed descriptions of 27 types of Circle industrial and commercial wiring products are featured in a four-page folder available from Circle Wire & Cable Corp., 5500 Maspeth Ave., Maspeth, N. Y.

Write in No. A116 on card, p. 21

CONDUIT FITTINGS — A new catalog describing their line of conduit fittings is now available from L. E. Mason Co., Boston 35, Mass. The illustrated, looseleaf-type folder contains information on design fea-

THE RED HANDLE SAFETY SWITCH GOES RAINTIGHT

ON
OFF
Removable cover and convenient "stay-up" cover catch for easier wiring. Contacts are plainly visible. Complete light and heavy duty lines available from 30 to 600 amperes.

Rain, sleet or snow, General Electric's new outdoor safety switches give the same reliable performance as the indoor models.

They're extra safe. The gasketed handle protects the operating mechanism for the life of the switch. The safety phase barrier protects against accidental contact. There are no fiber linkages in the mechanism to deteriorate with age, moisture or heat.

They're easy to install. Cover can be removed with only two screws. Convenient cover catch flips up at finger touch, stays up when two hands are needed for wiring. Mounting holes are raised for easy installation on uneven surfaces. Available in ratings from 30 to 600 amps, 240 and 600 volts, A-C. Write for bulletin GEA 6756 or see your G-E Distributor. Circuit Protective Devices Dept., Plainville, Conn.

GENERAL ELECTRIC

For more details on above items, use reply card on page 21

ADAPTABILITY

The "SCOTCH" Brand Electrical Tape No. 33 used to wrap splices on these television station power cables, insulates completely and snugly. Adaptable, it conforms neatly to both small and large size conductors, is easy to work with in tight, confined areas. Seals splices permanently for only a few cents. When tape costs so little, can you afford less than the best?

BALANCED FORMULA IS THE SECRET: Whatever the task, you can depend on "SCOTCH" Brand Electrical Tape No. 33. Its perfect balance of physical properties provides the ultimate in holding, protecting and insulating all in one wrap. Strong, stretchy, it has the perfect "feel" to get jobs done faster, done right. Tough vinyl backing shrugs off moisture, sunlight, heat, cold and other adverse conditions. Pressure-sensitive adhesive adheres instantly, holds permanently, without creeping or end-lifting. Low power-factor provides excellent insulation . . . high electric strength, wet or dry. For every job you can put your confidence in "SCOTCH" Brand Electrical Tape No. 33.

FIRST and still the best

Minnesota Mining and Manufacturing Company
. . . where research is the key to tomorrow

3M

"SCOTCH" is a Registered Trademark of 3M Co., St. Paul 6, Minn.

CATALOGS and BULLETINS

Available Free To Readers of

Electrical South

Upon Request

tures, specifications, ordering, prices, and shipping.
Write in No. A117 on card, p. 21

ELECTRICAL FITTINGS — A 40-page illustrated catalog and price list on the Gedney line. Shown and listed are conduit, threaded entrances, SEC, EMT and ground fittings and box connectors for both armored and non-metallic cables. Copies are available from Gedney Electric Co., RKO Bldg., Radio City, New York 20, N.Y.
Write in No. A118 on card, p. 21

SWITCH & OUTLET BOXES AND ELECTRICAL FITTINGS — Catalogs B-960 and F-960 respectively feature the latest in switch and outlet boxes and electrical fittings. Completely illustrated, they contain over 100 pages of technical and informational data. A unique set of indexes in the fittings catalog make it the easiest reference catalog in its field. Available from the Electrical Fittings Corp., 37-50 57th St., Woodside 77, New York.
Write in No. A119 on card, p. 21

STEEL WIRE—Technical information on Alumoweld, a newly developed aluminum-covered steel wire and strand, is contained in a 12-page catalog, just issued by the Wire and Cable Division of Copperweld Steel Co., 322 Frick Building, Pittsburgh 19, Pa. Illustrated and documented with engineering data, the colorful catalog provides a complete working knowledge of this new material—its properties, advantages, applications and construction practices.
Write in No. A120 on card, p. 21

PRESSURE CONTACT SWITCH—An 8-page folder (101-K) and a 4-page folder (200-EK) are available

Whether I Buy Assembled Fuse Boxes or *"Plug-In"* Components

I'M MONEY AHEAD WITH SQUARE D SERVICE EQUIPMENT

SAVES MATERIAL

Compact interior arrangement saves up to 22 feet of branch wire and at least one foot of service cable.

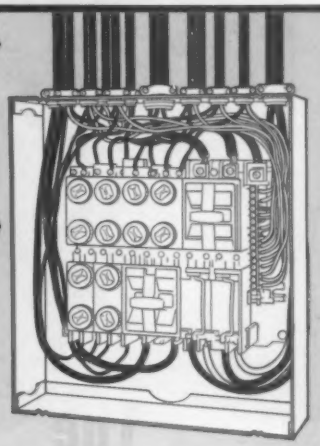
All line lugs approved for both copper and money-saving aluminum.

SAVES TIME

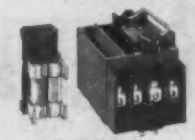
Extra-wide boxes—plenty of room to take ALL circuits in and out of either top or bottom endwall.

All split bus lighting circuits are prebussed. No wires to connect.

Box lugs for easy wiring on ALL load side connections. No washer head screws.



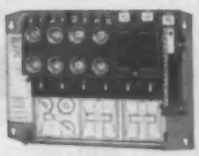
NEW COST-SAVING COMPONENTS



TANDEM PULL-OUT provides two 30 amp, 240V circuits in one plug-in unit

WATER HEATER PULL-OUT No need to mount separate water heater disconnect

DELTA PULL-OUT 3ϕ branches in low cost 1ϕ load centers



150 AMP INTERIOR for popular size homes

Extra Benefits of Off-the-Shelf Components

YOU START WITH 3 BOXES • That's all you need, in stock or on the truck, to rough-in any 100-200 amp service. No money tied up in interiors until the job is ready to be finished.

YOU GET INTERIORS LATER • No on-the-job damage because interiors are bought and installed after rough-in work is completed. Plug-in space offers flexibility. Add circuits required, leave space for the future.

PLUG-IN UNITS GIVE YOU FLEXIBILITY • Wide range of units available—120V twin plug fuse unit; 240V tandem 30 amp pull-outs; 240V, 30 and 60 amp single pull-outs; water heater and Delta pull-outs. Last minute changes or additions can't upset your wiring plans. Factory-assembled devices of FSP components also available.

Square D Company, Mercer Road, Lexington, Kentucky

SQUARE D COMPANY

wherever electricity is distributed and controlled

For more details on above items, use reply card on page 21

Surface or Semi-Recessed SQUARE

Vandal-Proof
Tamper-Proof
Weather-Resistant

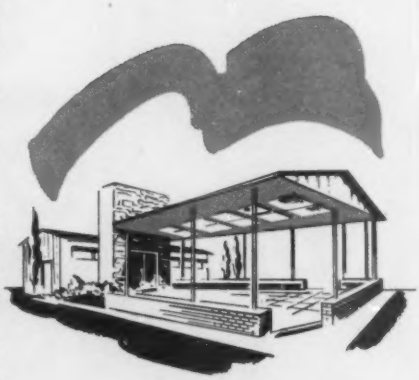
The Delta "PC-150"— The Ideal Light For Public Buildings and Areas

The PC-150 is a tamper-proof, vandal-proof lighting fixture specifically designed for use in public buildings and areas. The fixture accommodates up to two 100-watt A lamps in its double 14-gauge steel housing.

The steel mesh, welded to the outer housing, protects the Corning fresnel lens against vandalism. Theft is made difficult by spanner-head screws requiring a special screw driver for access to lamps.

Other safety items include the seating of the lens in a shock-absorbing foam-rubber gasket, a fiber-glass insulation between the fixture and the ceiling, and a safety chain to hold the outer steel housing to the inner housing to facilitate re-lamping.

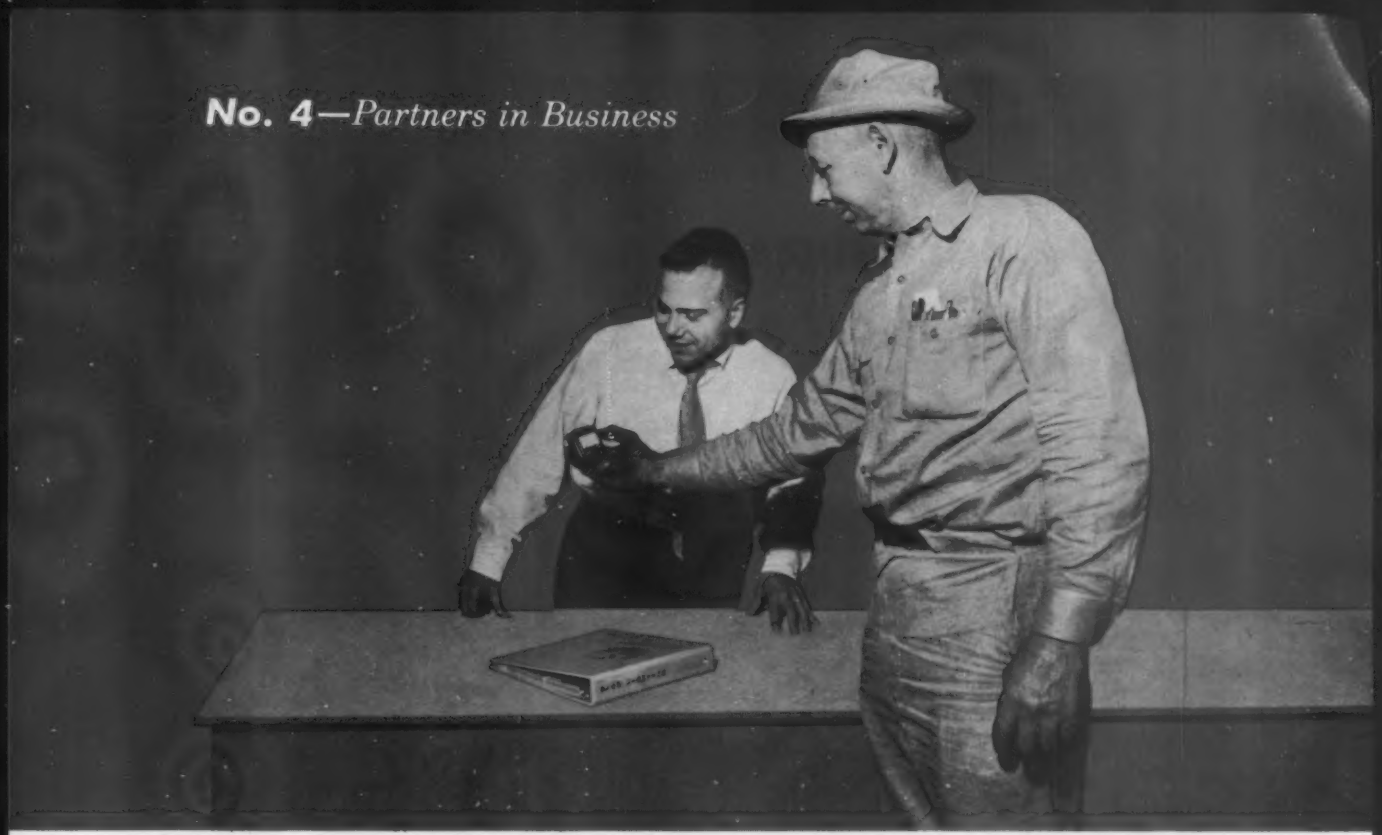
All component parts of the PC-150 are phosphate-coated for rust prevention and better adhesion of white-baked synthetic enamel finish. Other colors are available.



L & P LIGHTING

LIGHT & POWER UTILITIES CORP.
Olive Branch, Miss.
1035 Firestone Blvd., Memphis, Tenn.
Distributed by Wholesale Dealers Only

DELTA



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L & P only recently built a second, much larger plant in Olive Branch, Miss.—with 112,000 square feet of space, a scant 14 years after the company started in a little building with three employees. Hard work, a quality product, faithful employees all contributed much to this amazing growth, sure. But the one absolute essential that made it possible was: satisfied customers.

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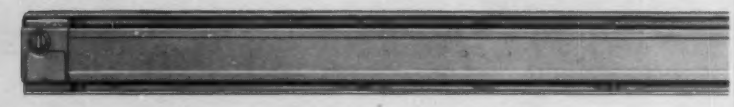

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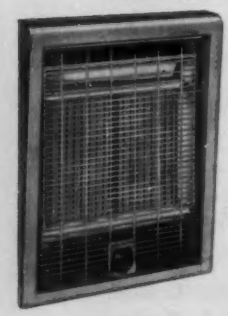

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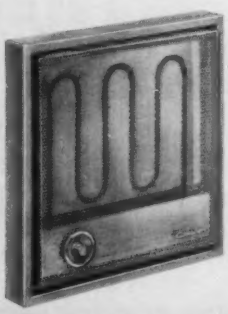

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from the Kelek Company, 59 Davis Avenue, Norwood, Mass., describing their Kam-Lok Pressure Contact Switch, open and enclosed models, respectively, for high-capacity use with current-limiting fuses for 250 and 480 volt service entrance applications from 1200 to 6000 amperes.
Write in No. A121 on card, p. 21

WIRE PULLING LUBRICANT — Illustrated six-page folder showing the advantages of an improved Y-Er Eas wire pulling lubricant is available from Electro Compound Co., 4145 W. 150th St., Cleveland 11, Ohio.
Write in No. A122 on card, p. 21

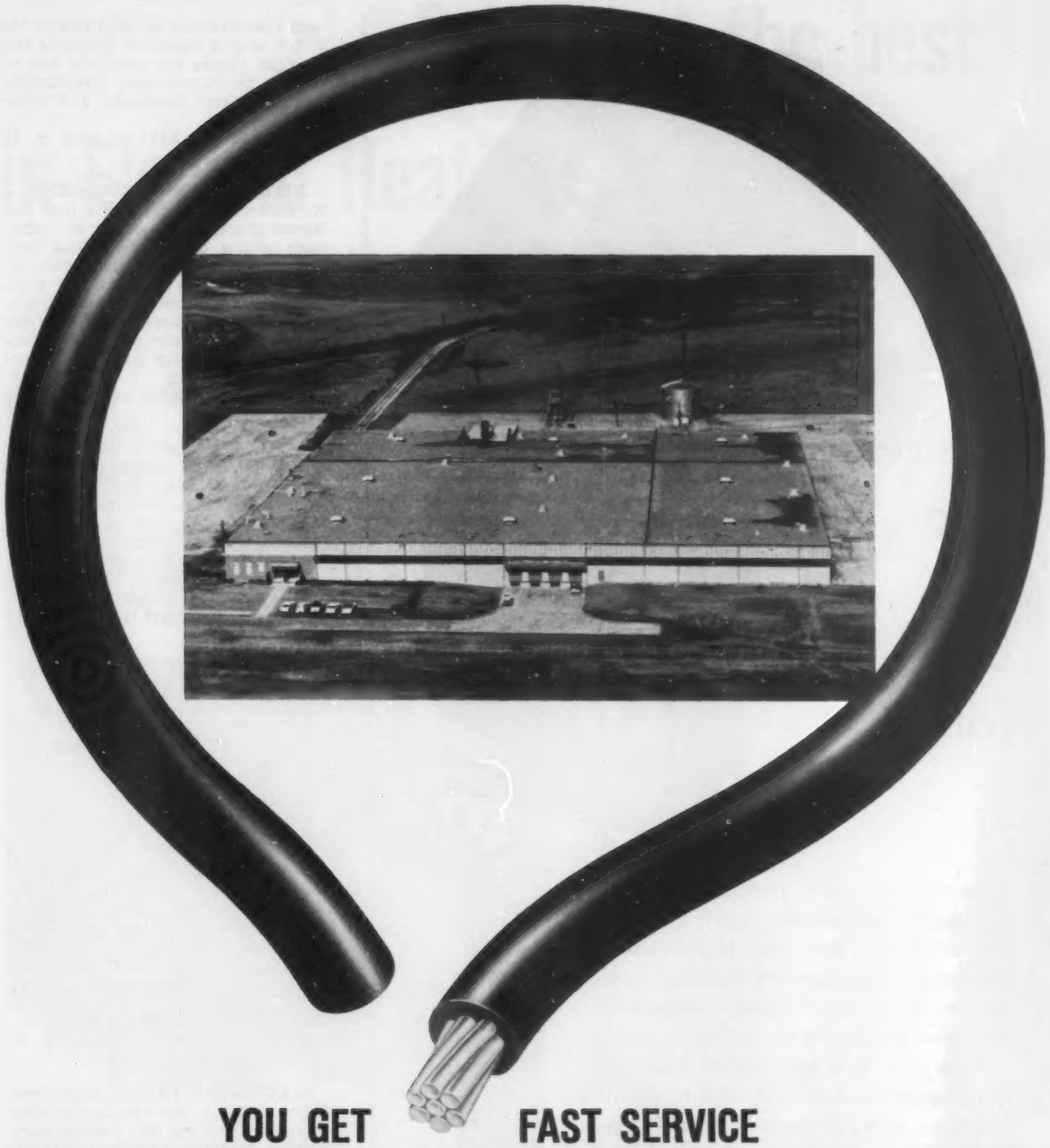
SELECTING FUSES — A 12-page descriptive handbook, Fuseology, tells how to get safest, most dependable, trouble-free electrical protection from fuses. Contains useful information on selecting right size and type of fuses —how to stop needless blows—avoiding poor contact and other troubles. Issued by Bussman Mfg. Co., University at Jefferson, St. Louis 7, Mo.
Write in No. A123 on card, p. 21

CLAMPS AND STRAPS — Some 600 clamps and straps are listed in a new catalog put out by Victor Specialties, Inc., 775 Main St., New Rochelle, N. Y. Catalog number, size, type, and price are listed for each item in numerical order under general categories. Illustrations are also included.
Write in No. A124 on card, p. 21

ELECTRICAL FITTINGS—Blackhawk Industries, Dubuque, Iowa, offers a complete catalog of electrical conduit and cable fittings. Also a special publication giving detail drawings and instructions for installing service entrance masts on low or ranch type buildings.
Write in No. A125 on card, p. 21

LIGHTING PANELBOARDS — A 4-page descriptive folder featuring a line of plug fuse and toggle switch panelboards for lighting control circuits is now available from Frank Adam Electric Co., 3650 Windsor Pl., St. Louis, Mo. The folder includes box sizes, details of construction, wiring gutters, special features, and catalog numbers.
Write in No. A126 on card, p. 21

ELECTRICAL ENCLOSURES — Catalog Number 6061 currently being offered to the trade by B & C Metal Stamping Co., 590 Means St., N. W., Atlanta 18, Georgia, is a well organized compact 132 page manual. The Catalog is divided into two distinct sections, one covering products for the Utilities, and the other section covering products for the Electrical Contractor. This Catalog offers complete descriptive information, prices,



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For more details on above items, use reply card on page 21

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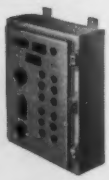
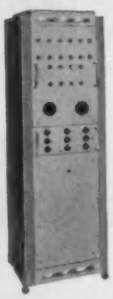
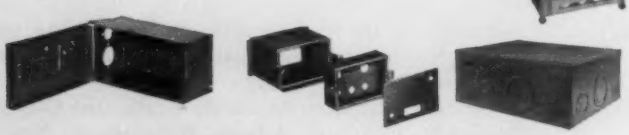
Whatever your wiring problem—Keystone can design and fabricate "odd", custom cabinets to meet your *exact* requirements. Complete engineering and manufacturing facilities assure you of prompt, dependable service on special wiring enclosures in any size, shape or style you need. So, turn your special problems into ready-to-wire solutions with Keystone's experienced Custom Products Division. Just send specifications and a drawing—*for a prompt quotation!*







KEYSTONE
MANUFACTURING COMPANY
DIVISION OF AVIS INDUSTRIAL CORPORATION
23333 Sherwood Ave. • Warren, Michigan

and specifications on all items in the B & C line of Electrical Products and Devices. Copies are available free of charge to Distributors, Contractors, Architects and Engineers, and Utilities.

Write in No. A127 on card, p. 21

DISTRIBUTION EQUIPMENT — Kuhlman Electric Co., P. O. Box 288, Birmingham, Mich., offers an eight-page catalog, CS-201, describing their line of distribution transformers of the single phase conventional type, 167 kva and below. Also available is an information sheet, CS-204, on the Kuhlman externally operated series-multiple switch for pole-type transformers 5-167 kva.

Write in No. A128 on card, p. 21

DUAL ELEMENT FUSES—A recently published catalog from Great Western Fuse Div., El-Tronics, Inc., Jamestown, N. Y., gives charts showing load data, as well as diagramed illustrations explaining features of dual element fuses. Ordering information and a cross reference guide of sizes is also included.

Write in No. A129 on card, p. 21

LAMP GUIDES—Sylvania Lighting Products, 60 Boston St., Salem, Mass., has made available three lamp guides containing general information, technical data, and catalog listings on their lines of fluorescent lamps, incandescent lamps, and mercury lamps.

Write in No. A130 on card, p. 21

ELECTRICAL ENCLOSURES — Adjustable and non-adjustable floor boxes, watertight outlets for floor use, and conduit hangers are shown in the 20-page revised catalog #750 available from Fullman Mfg. Co., Latrobe, Pa. Adjacent to each photograph in the catalog are specifications for the product pictured.

Write in No. A131 on card, p. 21

ELECTRICAL TAPES—Eight-page Accurate Tape bulletin details data on rubber, friction and plastic tapes. Bulletin features laboratory test results, includes complete packaging information. Immediately available from Accurate Manufacturing Company, Garfield, New Jersey.

Write in No. A132 on card, p. 21

PLUG-IN REELITE — Complete details about Appleton's lightweight, portable automatic Reelites are given in an attractive 4-page catalog insert. These devices find application in a wide range of occupancies: garages, loading docks, garment industry, construction crews, warehouses, machine shops, etc. Write to Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.

Write in No. A133 on card, p. 21

Bring out the best in Electric Heating with Honeywell quality controls

The new Honeywell T462 Line Voltage Thermostat offers the very finest for your economy-minded customers. A beauty in any room, this compact new thermostat gives dependable, worry-free performance—high load capacity plus accuracy and responsiveness. The new T462 was especially developed for electric heating, with a control range from 40°-85° with less than one-half degree differential. The T462 offers everything you could ask for in a quality-built line voltage thermostat.

Honeywell

First in Control

SINCE 1885

T462A—SPST Switching With Manual Single-Line Break in "No-Heat" Position.
T462B—SPST Switching With Manual Double-Line Break in "Off" Position.
For complete data on these and the complete line of low voltage controls, write Honeywell, Department ES-9-13, Minneapolis 8, Minnesota.

For more details on above items, use reply card on page 21

WHEREVER HOWEVER

YOU WORK WITH ELECTRIC HEATING

UNIT HEATERS
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you'll find performance improves with WHITE-RODGERS controls

...THE FULL LINE OF CONTROLS FOR ALL ELECTRIC HEATING APPLICATIONS

WALL THERMOSTATS — LINE VOLTAGE

Type 1A65

Outstanding contemporary appearance. Ultra-sensitive control knob "feels" both air temperature and radiant effect. Also available in double-pole disconnect model.

These two thermostats are sold **only** under the brandnames of more than 50 leading manufacturers of quality electric heating equipment.

Type 1A61

World's most widely used electric heat thermostat. Completely silent operation, sensitive to both air temperature and radiant effect. Single- or double-pole disconnect models.

Type 152-9

Controls most line voltage heating applications without use of relays or contactors. Positive snap-action contacts. Available with or without thermometer.

INTEGRALLY-MOUNTED CONTROLS

Type 1A68

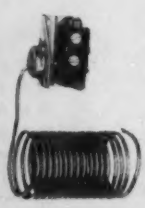
Extremely compact, highly sensitive single-pole thermostat mounts easily in horizontal or vertical position in baseboard or separate thermostat section, in wall heaters, portables or other heaters. Also available in double-pole model (Type 1A69).

Type 261

Remote-bulb thermostats combine space-saving compactness, unusual sensitivity, narrow differential, silent switch, efficient operation in ambient temperatures as high as 150° F. Available in single-pole model, with choice of adjustment ranges.

Type 262

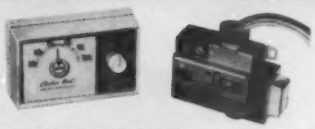
Double-pole disconnect model, with positive "OFF" position. Easy mounting interchangeability with other makes. Silent switch, shaft adjustment in 240° arc. Ideal for all types requiring both-side line break.



Type 263

Linear limit control provides positive overheat protection along entire length of baseboard. Temperature-sensitive bulb reacts when air passage is blocked for even so short a distance as 6". Automatically recycling. Available in various lengths.

NEW LOW VOLTAGE CONTROLS



Type 120-260 Thermostat
Type 24A01G Silent Operator

Level-Temp System for use where low voltage control of electric heat is desired. Attractive Level-Temp thermostat provides highly sensitive control through the Level-Temp Operator, which handles the line voltage heating loads **silently** and dependably. Small size permits mounting operator integrally or remotely.

Type 24A11

New "Sequencer" control provides step-timed, low voltage control of such larger-capacity heating units as central furnaces, blast-coil heaters and other applications. Highly versatile circuitry makes control ideal for use on OEM-assembled pre-wired panel installations.

FARM APPLICATIONS

Type 265

Compact, very rugged control has specially designed Hydraulic-Action element for quick response necessary in such temperature-sensitive farm applications as pig brooders, soil heating, etc. Exclusive bulb design permits it to pass through ½" conduit bent in a radius as sharp as 7". Single- or double-pole models.

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For more details on above items, use reply card on page 21

KNOW YOUR SYMBOLS

This symbol stands for fusible switch

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THE SAFETY SWITCH THAT CHALLENGES COMPARISON!

BullDog's general-duty safety switch – a star performer indoors and out!

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. . . Plus, all current-carrying parts are silvered. And with BullDog, you sell a complete line, competitively priced, that fills all over-the-counter calls for general-duty safety switches. The switches are available in both NEMA 1 and NEMA 3R enclosures. Challenge our field representative to prove these switches are the finest . . . or write BullDog for details.

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I-T-E CIRCUIT BREAKER COMPANY
BULLDOG ELECTRIC PRODUCTS DIVISION

Contact the I-T-E Office in your locality for additional product information and service.

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New switchboard and busway update

An electrical modernization program will nearly double service capacity

This article should be especially helpful to the following readers:

- Electrical Contractors
- Electrical Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

By Bob King, Southwestern Editor, Dallas, Texas.

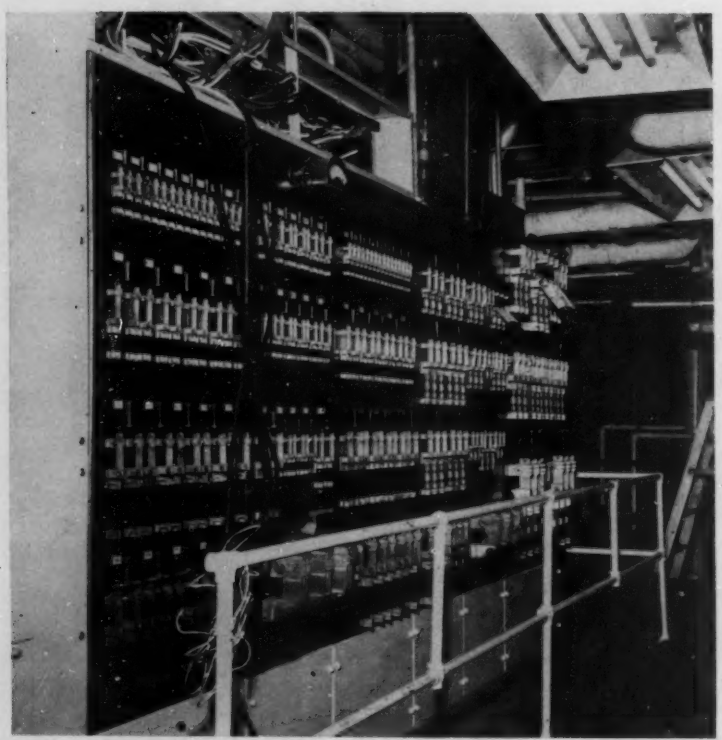
◆ How to modernize a 38-year old wiring system was demonstrated in Dallas recently with the installation of a modern new switchboard and service busway in the Dallas Athletic Club office building — part of an electrical modernization program that will nearly double the existing service capacity.

Roy Gay, president of Gay Electric Co., Dallas, contractors for the job, said that the 38-year old wiring for the building was obsolete and badly overloaded before the present changeover.

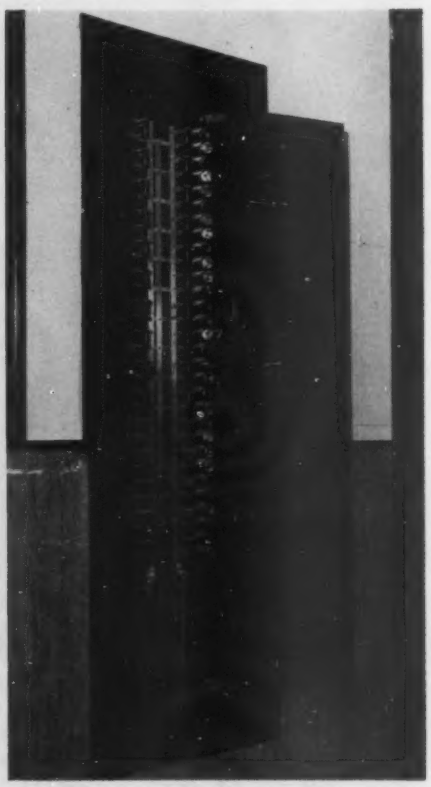
It was estimated that there was at least a 20 per cent overload on the old equipment, which consisted of an open type switchboard fed through a floor trench and lead cables leading from the transformer vault.

This has been replaced by a 4,000-ampere, three-phase, four-wire, low-impedance overhead aluminum bus duct which feeds the new NEMA class III switchgear. The switchgear was designed and manufactured by Federal Pacific Electric Co., as specified by Joe Schwegmann, consulting engineer for the job.

The new switchgear is capable of withstanding a fault of 100,000 amperes by the use of current limiting fuses and high interrupting



The three panels on the left of the old switchgear are out of service and will soon be removed. Above the panels can be seen lines tied in from the new switchgear. The panel on the right services air-conditioning compressors and elevators. Future plans call for its removal and replacement by a new switchgear such as the one already installed.



The old system used 110/120-volt, three-wire lighting panels of the fuse-plug type, now replaced by 42-circuit panels.

old wiring

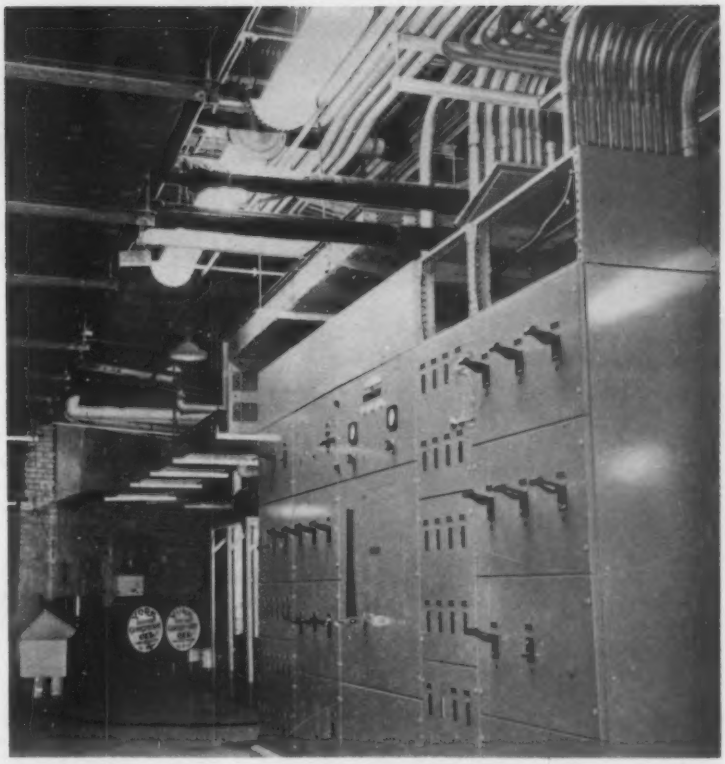
of this building

capacity molded case breakers. The breakers have 75,000-ampere interrupting capacity at 240 volts, a.c.

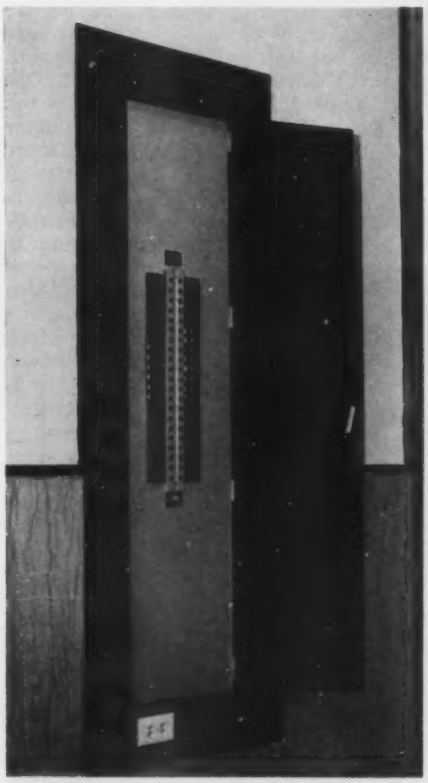
Behind the old open type switchboard were dozens of pull-type safety switchboxes mounted on the wall in several rows. These have all been removed, and lines from the new switchgear tied in above the old switchgear to pull boxes which have been installed on the existing equipment.

The old system, with 110/220-volt, three-wire lighting panels of the outmoded fuse-plug type, has

(Continued on page 122)



Low-impedance overhead aluminum bus duct feeds the new switchgear.



This 42-circuit, 100-ampere panel with 20-ampere breakers was put in service on one of the upper floors of the building.

Participating in the installation of new electrical equipment in the Dallas Athletic Club office building were, standing, left to right, J. F. Schwegmann, consulting engineer; Charles W. Andrews, chief engineer for the building; Ross Boling, district manager for Federal Pacific Electric Co., manufacturers of the switchgear; and Roy Gay, president of Gay Electric. In front are, left to right, L. B. Raney, chief electrician for the building; Carl E. Cronhom, job foreman for Gay Electric; and Gary Ferguson, electrician with Gay Electric.

Contractor actual trial report

Cable tracer performs its job well

'I like this new instrument,' says user after flawless performance

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers ✓
- Consulting Engineers

By Fred W. Goette, III, Goette Electric Co., Macon, Ga.

◆ Advanced methods and tools are invading our electrical construction industry so rapidly that it's difficult to keep abreast of all the latest developments.

New tools are almost invariably advertised as being timesavers, or as taking the place of a helper on certain jobs. One of the latest entries into this field is the Amprobe Cable Tracer. In an effort to determine how it actually performed, it was given an on-the-job test.

Pyramid Instrument Corporation developed the cable tracer as an aid for fast, easy tracing of uncoded cables in complex, modern electrical systems. As you well know, the old method of shorting out pairs of wires and then "ringing them out" requires two men or the services of a track star to run from one end of the system to the other. Now let's see if the cable tracer will eliminate some of our problems.

Easy to use

By following the instruction book provided by Pyramid, the instrument was easy enough to put to use. It arrived packed in a case containing the cable tracer, ten cable markers, two marker holders, and three test leads equipped with alligator clamps.

As an example of how the instrument is used, let's say that you are installing a low-voltage wiring system in a residence. In a run from the relay box to a four-gang switch box there are four cables of perhaps three conductors each.

To identify the ends of each cable, insert a pair of wires from each cable, say the red and white ones, into four of the cable markers. These cable markers are numbered one through ten and have receptacles which open with finger pressure to accept the lock onto two conductors. Then, at the other end of the cable run, insert a red and a white conductor from any cable into the receptacle on the cable tracer itself.

When the indicator button is depressed, a number, identical to the number of the cable marker on the other end of that particular cable, will light up. Thus both ends of a cable have been positively identified and the proper connections can be made. The three other cables are tested, or traced, in like manner.

Setup different

When you are working with a number of single conductors in a conduit the required test setup is a little different but the principle remains the same. In this case, the conduit, or ground, is used as one of the paths between the cable markers and the cable tracer.

To facilitate grounding one side of the cable markers, two metal marker holders are provided. These holders will each accept five of the markers and they connect one side of all the markers mounted on them together, while leaving one side of each marker available to accept the wires being traced.

One of the leads with an alligator clamp is used to ground the holder. Another of these leads is used to ground one of the receptacle terminals of the cable tracer at the test end of the conduit. The wires being traced are connected one at a time to the remaining terminal on the cable tracer.

Again, appropriate numbers will light when the indicator button is depressed. Amprobe supplies adhesive backed, numbered tabs to mark wires as they are identified.

Only one thing was left out of the little instruction book that came with the instrument. That is an explanation of how and why the cable tracer works. Since everyone I know in this business has a naturally inquisitive mind, a close look inside the cable tracer should be in order.

Each of the cable markers contains a small resistor, ranging in value from about 3,500 ohms in the No. 1 marker down to 45 ohms in the No. 10 marker. Inside the cable tracer itself is a sensitive ammeter mounted on a printed circuit board which also holds a 1.4-volt battery and the ten indicator lamps.

When a cable is tested, the resistor in one of the cable markers is actually connected in series with the battery-ammeter circuit. Obviously, if marker No. 1 is in the circuit, the needle of the ammeter will barely move, but, if marker No. 10 is in the circuit, the needle will swing almost to full scale.

There is a conducting path leading from each indicator lamp to the arc described by the ammeter needle. The circuit values are so computed that if marker No. 1 is in the circuit the needle will move up the scale until it is directly over the conducting path to lamp No. 1. Depressing the indicator button causes a tab on the bottom of the ammeter needle to move down and make contact with whatever lamp circuit the needle is hovering over, placing battery voltage on that lamp.

On the printed circuit board you can see a small triangular mark at the upper end of the meter movement. When the instrument is assembled this mark can be seen through a clear window on the instrument case. This is a reference point used in calibrating the instrument.

Depressing the receptacle button shorts out the circuit that is usually connected to the cable markers.

(Continued on page 122)

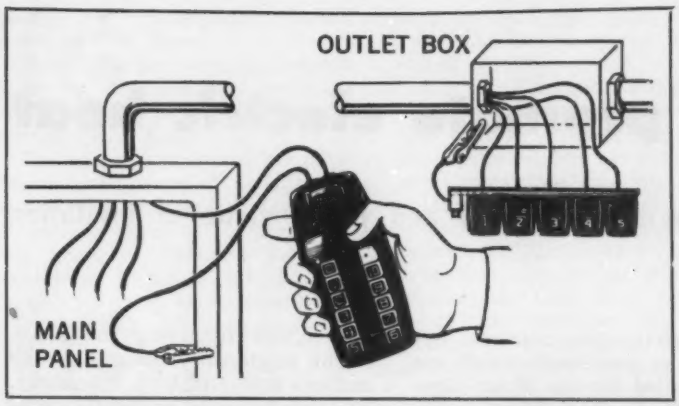
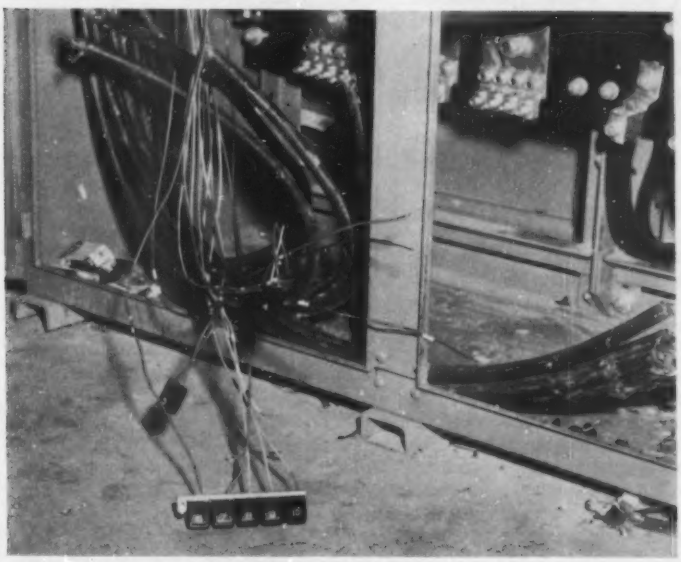
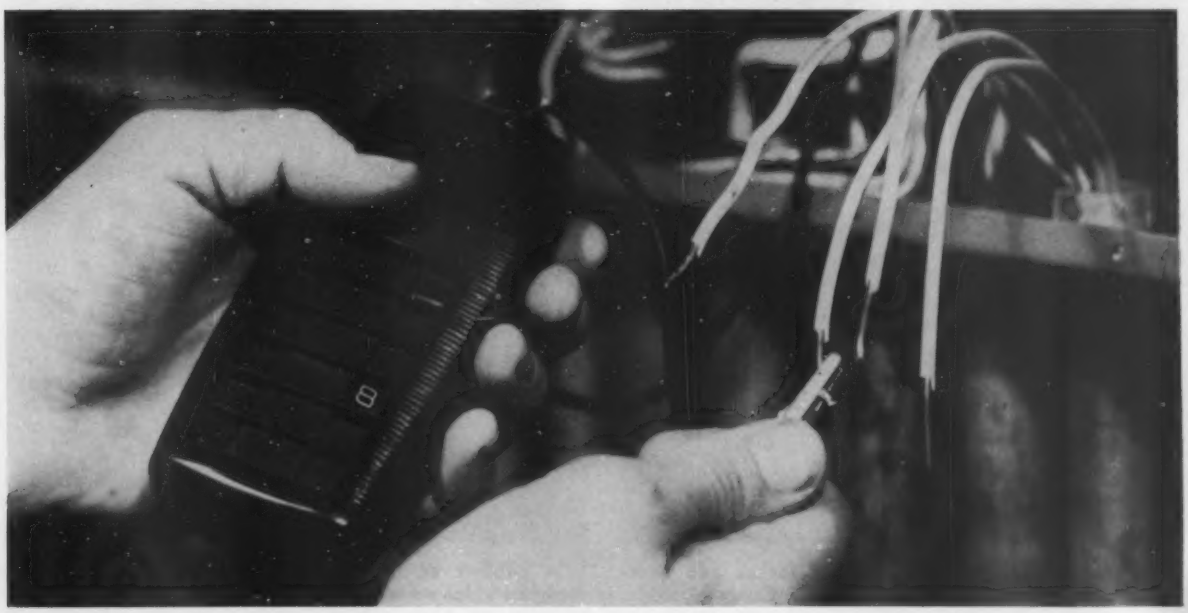


Fig. 1—When a cable is traced, the resistor in the numbered cable marker is connected in series with the battery-ammeter circuit.



A cable marker holder is used on this wiring.

Left: A marker holder, two of which are provided, will accept five markers while leaving one side of each marker available to accept the wires being traced. Below: Appropriate numbers light up when a wire is being traced.



Test houses promote electric heat

Studies show performance characteristics and prove value of insulation

This article should be especially helpful to the following readers:

- Electrical Contractors
- Electrical Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ Numerous test homes sponsored by various organizations in the South and elsewhere are helping to promote the use of electric space heating, by producing actual proof of the benefits, costs, and other factors which must be considered by contractors and customers alike when planning an installation.

One test program currently being conducted is that sponsored by the University of Kentucky in cooperation with the Kentucky Utilities Co. Another program involves two houses—identical except for the insulation—which are being studied by the Wood Conversion Co., St. Paul, Minn.

The Kentucky project involves a bright red farmhouse high atop a hill at Dix Dam, Herrington Lake.

Built by the University of Kentucky College of Agriculture and Home Economics and the Kentucky Utilities Co., it is really many houses in one. The university and KU are using it to conduct important research on the use of electricity for a variety of household jobs, particularly heating.

It is the end result of a design and construction study for a small practical all-electric home which can be readily duplicated in any section of the state, using materials easily available and labor available locally in rural areas.

The university and the electric company shared costs, with KU footing the bill for materials and the college supplying the labor.

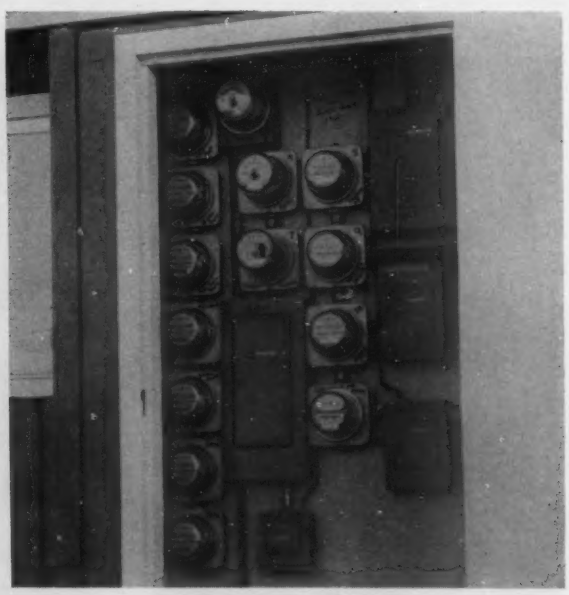
The single-story house has two sections separated by a breezeway. The living portion has an L-shaped kitchen-dining-living room, two bedrooms, a family room, and bath. Across the breezeway is the combination shop, office, storage area, and wash-up building.

The house is on a poured concrete slab. The outside of the house is exterior plywood with batten boards. The house is fully insulated. The area of the main residence is 1,080 square feet; area of the shop and office is 154 square feet.

Electrically, the house qualifies as a Gold Medallion Home. The wiring is certified for Full Housepower for convenience, safety, and adequacy. Lighting follows the "Light for Living" standard of the American Home Lighting Institute.

A cabinet hung on the rear of the house holds the key to the research possibilities. In it are 14 electric meters which measure just

This programmer controlled all appliances and heating units during the Wood Conversion Company tests.



A cabinet at the Kentucky house holds 14 electric meters which measure the electrical demands in the house.

about every individual electric usage in the house.

They'll supply accurate answers to a lot of questions, including facts about the room-by-room electric heating use.

The house is designed for other research, too, such as comparison of the efficiency and performance of various types of electric heating, since in different locations have been installed ceiling cable, baseboard units, wall heaters, and ceiling panels, all metered separately.

Tests also can be made to determine whether there is a worthwhile saving in turning down bedroom thermostats at night or reducing temperatures in vacant rooms in electrically heated homes. This is a field where little actual research has yet been done.

Another research possibility in the house is a study of the effect of daytime attic ventilation as well at the customary night ventilation.

Wood Conversion project

Wood Conversion Company is now releasing data to members of the heating and building industry from its $250,000 study, begun in 1959. Covered are such subjects as actual versus calculated heat loss, the effect of solar radiation, insulation and comfort levels, the effect of insulating basement walls, soil temperatures, the value of insulated sheathing, and other factors affecting total heat loss.

Two homes, identical in every respect except for the type and thickness of insulation used in the ceilings, walls, and floors, were constructed especially for the research program.

The houses are one-story, 1,100 square feet in size, with a crawl space under the living-dining room area and a basement under the balance of the house. They were heated by electric baseboard heaters. Eleven meters were installed in each house.

Each house was "occupied" with invisible families of four persons simulated by heating elements which duplicated the heat given off by mythical persons. Humidifiers were used to provide moisture exhausted by humans and cooking. Living habits of the two invisible families were controlled by a programmer which automatically turned on and off all major appliances and heating units that represented human body heat.

A complete U. S. Weather Bureau system records outside temperatures every 2½ minutes as well as wind speed and direction and solar radiation, the latter by use of a pyrheliometer.

G. A. Erickson, engineer in charge of the test house project, said that the results are still being compiled but several conclusions regarding heating and insulating homes have been reached.

Perhaps the most significant fact proved by the research program was that the actual energy for heating the first floor proved to be 29.3 per cent less than the calculated heat loss based on standard computation methods.

This great difference between calculated and actual heat loss measured during the 1959-60 heating season—which was eight per cent colder than normal—is due to several factors, such as the insulation performance of the Wood Conversion Company Balsam-Wool used in the test houses, which exceeded laboratory projections for this product, a lower rate of air change, and the fact that heat gain from internal heat loads and solar radiation is normally not considered in the calculation.

Converting the actual heating energy to a heat factor, the test houses showed 1.31 kwh per square foot per 1,000 degree days. This compares to the national average of 1.8 to 2.0.

Different types and thicknesses of wood fiber blanket insulation

(Continued on next page)

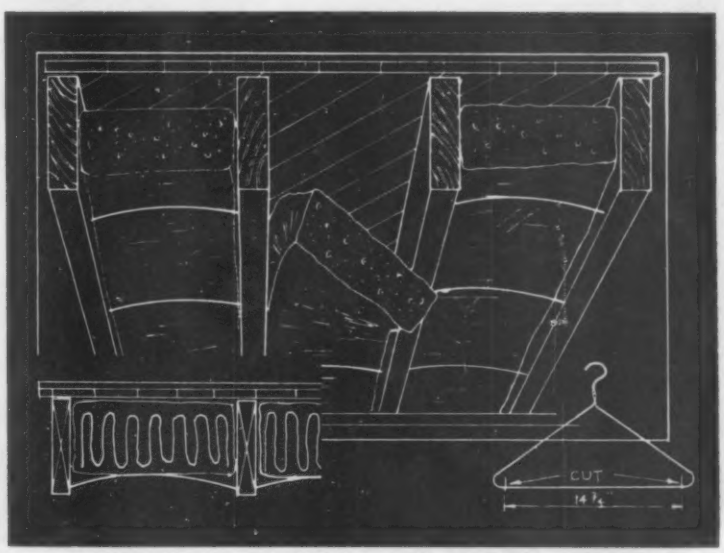
Heat specialist uses coat hangers to secure floor insulation in place

◆ One of the problems of applying home insulation — that of holding six-inch fiberglass batts in place under the floor with the vapor barrier on the warm side—has been solved with the use of ordinary wire clothes hangers.

Marvin Stacken, electric heating specialist for the Kansas Power and Light Co., originated the idea while he was installing floor insulation on his own all-electric home.

As the sketch shows, Mr. Stacken cut a piece of wire clothes hanger to the desired length and wedged it up against the insulation. It required three pieces of wire for each four-foot batt. This application lets the insulation retain its desired thickness, yet holds it firmly against the floor. The utilization of the coat hanger provides just the right consistency of springiness for this application.

Mr. Stacken spent three weeks collecting 500 hangers for the job.



A 14-¾-inch segment of coat hanger holds insulation to the flooring.

were purposely used in the Wood Conversion test houses. The difference in heat consumption between the two buildings was a mere 5.5 per cent due primarily to the more efficient ceiling insulation (five inches as compared to a 3-5/8-inch blanket) in one house. Wall and floor insulations were of about equal efficiency.

The better thermal construction for comfort and economy of heating also makes the home more comfortable in hot weather and reduces the size of the air conditioning plant required.

"About two-thirds of the total heat loss of the average well insulated house is through windows, doors, and by air infiltration, pointing out a very fertile field for improvement by use of good quality windows with multiple glazing, tight storm doors, weather stripping, etc., to achieve a better balanced heat loss condition," Mr. Erickson said.

The test results indicate that triple glazing is advantageous in reducing heat loss, window condensation, and in providing warmer inside surface temperatures. In the test houses, where windows and doors constituted 15 per cent of the gross wall area, triple glazing in the north facing bedroom reduced heating costs for this room about 12 per cent as compared to double glazing.

Field results showed that the importance of solar radiation, although widely recognized, has not been properly evaluated in heat loss calculations. It was found this natural heat supply provided about nine per cent of the total heat required during a three-week period in February—demonstrating the importance of proper orientation of the structure and placement of windows.

The tests also proved another building theory—that a well insulated home feels more comfortable to its occupants. This was proved through the measuring of temperature gradients in five rooms at various levels from floor to ceiling.

This system used ten miles of wire to feed temperature readings from 303 copper constantan thermocuples to four recording potentiometers. Over a million readings were obtained during the heating season.

During zero-degree weather, the inside wall surface temperatures averaged 67-68 F or only two to three degrees lower than the inside air temperature. The floor to ceil-

(Continued on page 121)

Card index system

Numbering tools and maintaining

Names of tools can be easily seen on the bottom of each card.

W. A. Barnett keeps a close check on tools in the warehouse.

keeps track of tools and equipment

accurate cards enable firm to know where each item is being used

This article should be especially helpful to the following readers:

Electrical Contractors ✓
Electrical Utilities
Electrical Wholesalers
Electrical Inspectors
Industrial Engineers
Consulting Engineers

By Ross Holman, Field Editor, Nashville, Tenn.

◆ Edenfield Electric, Inc., believes it has gone a long way toward solving one of the most vexing problems with which electrical contractors have to contend.

This company, located in Nashville, handles construction jobs all over the South and uses in these operations over 500 work tools. As with other contractors, some of these tools had been getting lost, misplaced, or had otherwise disappeared. And with most electrical construction operators the loss of work tools has been an important drain on profits.

However, several months ago Edenfield worked out a card index system that enables the management to pinpoint every piece of work equipment it is supposed to have in use. "We won't say this method is perfect," says Ed Edenfield, one of the four Edenfield brothers who mastermind the jobs of this company. "But we are mighty well pleased with the way it has worked out so far."

Each piece of work equipment worth $10 or more is listed on a separate card. Altogether the cards list such things as ladders, electric hammers, electric drills, hydraulic benders, pipe threaders, vises, chain hoists, and every other such tool that enters into a construction job.

Numbered tools

Each tool has a number, which is either etched into it or is entered on an attached brass tag. The index card shows the tool number, tool name, date it was taken out on a job, the name and number of the job, and job foreman or superintendent to whom it was issued, and the date it was returned to the Edenfield warehouse.

W. A. Barnett, Edenfield's warehouse manager, is the man who issues these tools and keeps the card index up to date.

"The Edenfield company has handled jobs in 27 states," says Mr. Barnett. "I would hardly know how to describe the system we used before starting our card record, but we had to depend heavily on our memory as to which vise or pipe threader, for example, went to that job—also when or whether it ever got back to us.

"Now my card record shows just where it is being used. After the job is finished I enter the date of return on the card. After that, until it goes out on another job, the return date on the card indicates that specific tool is in the warehouse."

Easy to check

When Mr. Barnett wants to check the whereabouts of an electric drill, for example, he pulls out the file drawer. In the drawer the cards are lying flat, each one overlapping the other, leaving below the lap on each card enough margin to write the name of the tool and leave the name visible to the eye when the drawer is pulled open.

When the eye spots the card with the listed drill number and name, all the manager has to do is lift the card up and learn from the entries where the tool is.

"Before we adopted this system," says Ed Edenfield, "it was easy for a tool to get misplaced with no one knowing just where it got away. For example, on one occasion before beginning this card record, we couldn't find a certain needed bender which we knew we possessed. We couldn't find it in our warehouse and no one could remember just where it was last used.

"Finally, someone found it at a church which we had wired some time before. The crew that wound up that job had overlooked it when cleaning up the equipment and supplies. That shows how easy it is to lose a $60 or $75 piece of work equipment and add that much to the cost of doing the job."

Five work trailers

Edenfield keeps five work trailers for its various construction jobs, which are scattered over the country. For example, if it contracts a wiring job in Birmingham, the working equipment, wiring, and wire fixtures are loaded on one of the five trailers.

As each work tool is loaded on the trailer Mr. Barnett makes the proper entries on the index card corresponding to that tool, with the name of the job foreman to whom it is issued. The wiring supplies themselves are listed on a requisition sheet.

As the Birmingham job progresses new tools and supplies may be sent to it by truck and listed on the records the same way. When the contract is completed the work tools are checked back into the warehouse by the simple entry of the return date on the covering cards. The leftover wiring supplies are credited to the original requisition sheet.

The work trailer that goes to a specific job is used as a field office for the superintendent in charge and as a warehouse for the material used on the contract. If the trailer isn't large enough to house all the material, Edenfield sends one or more prefabricated tool sheds to the job, buildings in which material can be locked up at night.

Ed Edenfield says that most of their electricians have been with the firm for many years and are thoroughly dependable. They are as conscientious about keeping up with the equipment as the owners themselves. But the card index system makes it much easier to do

(Continued on page 121)

Versatility in lighting permits night

New school reflects cooperation between architect and electrical

Recessed dome lighting in the ceiling is shown in this corner of the school auditorium. The ceiling spotlighting fixtures can also be seen.

This article should be especially helpful to the following readers:

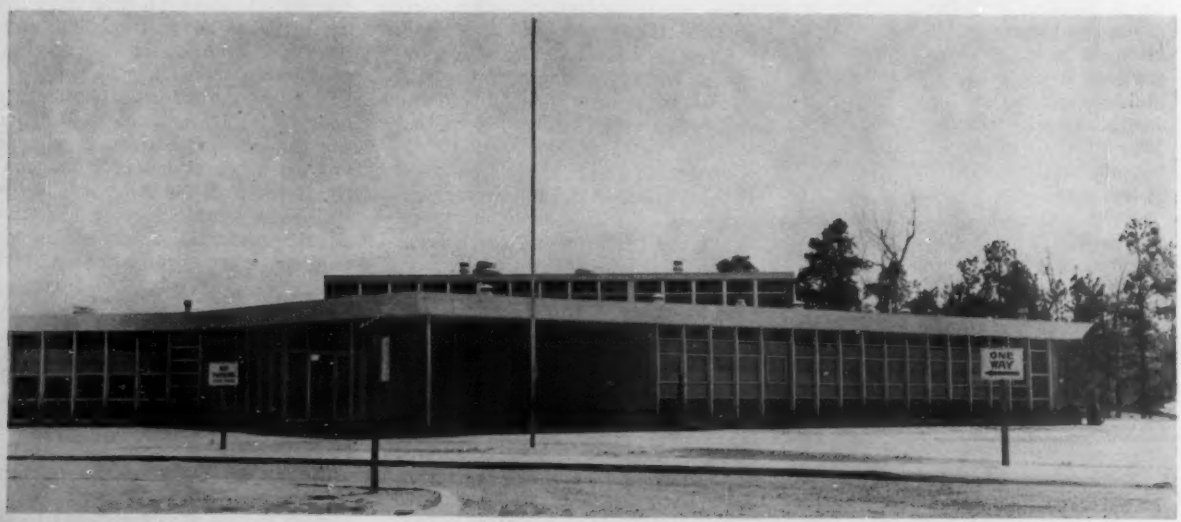
- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers ✓

By S. W. Ellis, Electrical South Field Editor, Little Rock, Ark.

◆ Electric lighting of the newest schools in Arkansas is receiving special attention from architects who create plans for utility and beauty.

An outstanding example of cooperation between architect and electrical contractor is the Perrin Elementary School in Benton. In a streamlined structure of classrooms, kitchen, and utility areas, arranged around a vast room that doubles as an auditorium and a cafeteria, electric lighting delivers multiple performance.

In "the school of a thousand windows," as the new school has



Day and night illumination allows the building to serve dual role as a school and a community activities center.

contractor

been named, incandescent recessed lighting, all around each room, produces correct lighting for day or night.

H. L. Boyce, of Stowers & Boyce, architects for the school, says that lighting for schools is even more important at night than during the day. The modern school is a community center, used frequently at night for educational, social, and sports events.

The lighting for the Perrin Elementary School auditorium was especially planned for night and day use. Recessed plastic domes, spotted over the entire ceiling, produce a daylight effect in cloudy weather and at night. Special spot lighting is provided for the stage in one corner of the area.

Each of the classrooms is provided with nine 300-watt ceiling fixtures.

The Houston Electric Co., Little Rock, did the electrical contracting. Owner Bill Houston admits that he gets a lot of the electrical work for schools throughout the state because he works closely with architects. This job was a $25,000 contract for him, completed by four electricians assigned to the job.

School contracts sought

"I supervise all work" he says. "Starting out deliberately to win school contracts, I determined to work closely with the electrical engineer or the architect. That called for quality work on every job, which I deliver through close personal inspection."

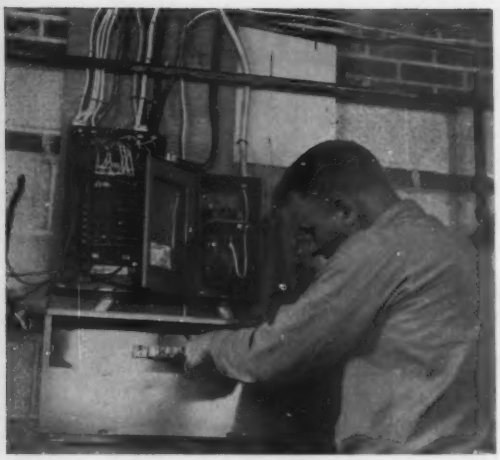
The job for the Perrin Elementary School combined cooling along with lighting. In the long corridor that extends down the front of the school, four ventilating fans, exhaust type, are used for cooling. Two are also used in the auditorium, and one in the kitchen.

With window space all around the school, which is built in a pleasant, open area, fans are adequate at present for cooling. However, Contractor Houston kept future air conditioning in mind

(Continued on page 120)

Four exhaust-type ventilating fans are installed in this long corridor, as part of a combined lighting and cooling arrangement for the school.

Already prepared for the expected demands of future school growth, this panelboard will take care of expanded electrical service.



Top: Supervisor Frank Stetka looks in on a job where a five-ton air conditioner was installed through the salesmanship of a mechanic, who pointed out a neighbor's recent installation. Left: Mechanic John Sanford explains to a homeowner why she needs a 200-ampere service for her air conditioner. Right: Mr. Sanford works on another job obtained through salesmanship.

Incentive plan sells half of jobs

Mechanics receive two per cent bonus for work over original order

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

By Frank Stetka, Master Electrician and Supervisor, Customcraft, Inc., Bethesda, Md.

◆ There is no substitute for a good incentive pay plan, and practically 50 per cent of the 1,600 electrical jobs we handled last year may be attributed to the alertness and good salesmanship of our seven mechanics who are on a two per cent incentive pay plan for work they succeed in selling and carrying out above the original order.

During the first quarter of 1961 we handled 450 jobs, of which 80 were in excess of the corresponding period of 1960. This gain we attribute to the conscientious effort of our personnel to observe service equipment, call attention to defective and illegal wiring, and stress the need for heavying-up service.

An incentive pay plan beats problems of labor turnover, instability, and absenteeism. Weighed against paid vacations, paid time off, and similar benefits, an incentive pay plan is preferred by mechanics. They enjoy the higher earnings that an incentive pay plan brings. Each of our men earns from $10 to $20 a week extra through our incentive pay plan.

This is how the incentive pay plan works: a call may come in that lights are out in a residence, and our mechanic discovers an overloaded circuit.

He has a choice of either in-

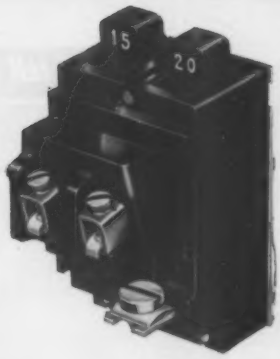
(Continued on page 119)

KNOW YOUR SYMBOLS

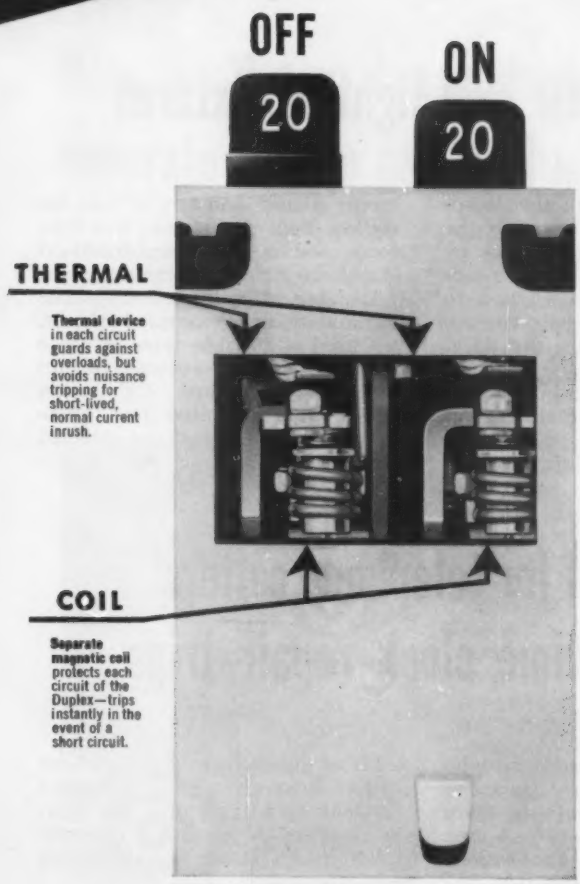
This symbol stands for circuit breaker

This symbol stands for QUALITY

BullDog Duplex Pushmatic—



Still the leader in residential safety and convenience!


OFF
20
ON
20
THERMAL
Thermal device in each circuit guards against overloads, but avoids nuisance tripping for short-lived, normal current inrush.
COIL
Separate magnetic coil protects each circuit of the Duplex—trips instantly in the event of a short circuit.

The leader in safety . . . BullDog's Duplex Pushmatic® circuit breaker provides two protective systems in each circuit. A thermal control teams up with a magnetic coil to assure maximum protection under *any* residential operating condition and to avoid nuisance tripping. Bolted bus-bar connection assures tight, positive contact that prevents overheating. This maximum electrical safety is your best protection against costly trouble calls!

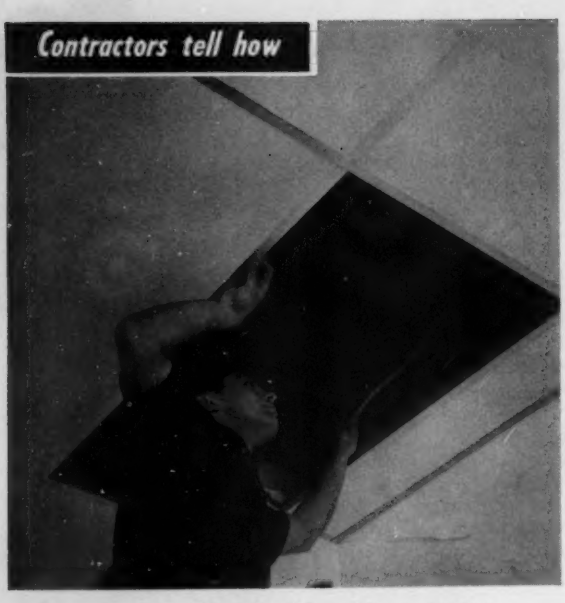
The leader in convenience . . . the Duplex Pushmatic puts two general-purpose circuits, 15 or 20 amps, in the panel space of one—provides maximum circuit flexibility with smaller, less expensive panels. And the Duplex is the *only* breaker with exclusive pushbutton convenience. Also, a tripped breaker can be identified instantly by sight or touch, resets with a push of the finger. For complete details on Pushmatic breakers and panels, write for your "Pushmatic Pocket Guide"—*it's free!*

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Mich. In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N. Y.

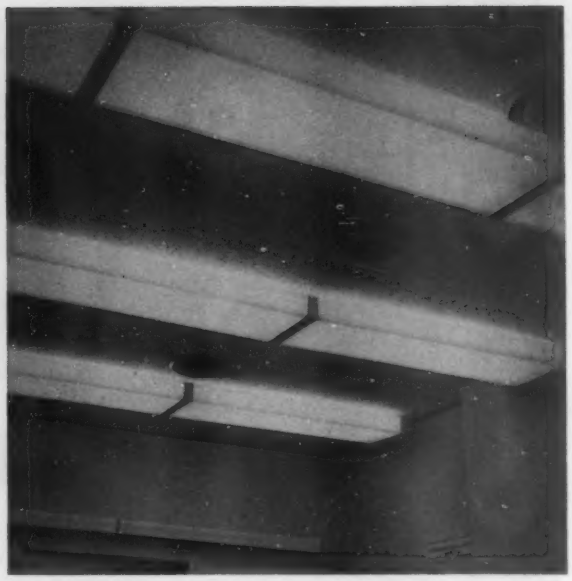
I-T-E CIRCUIT BREAKER COMPANY
BULLDOG ELECTRIC PRODUCTS DIVISION

Contact the I-T-E Office in your locality for additional product information and service.

Contractors tell how



In unoccupied offices flexible cable awaits fixtures.



The drafting room has continuous fluorescent lighting.

Office tenants can choose their own lighting fixtures

By Joseph Accardi, Estimator, Trovato Electric Co., Arlington, Va.

◆ While good lighting for working efficiency was an essential in the drafting room of the construction company located in the new Hooper Building, decorative lighting was stressed in the reception room.

With a view to adapting lighting to the needs of each tenant, the ceilings in this office building are of acoustical removable tile panels so that fixtures can be hung after a tenant designates the type and number of fixtures he wants.

BX cable was used in this steel joist constructed building. In order to hang a fixture securely we found it necessary to use a long all-thread steel rod and by means of a nut and washer the fixture was fastened securely to the steel joist.

In the corridors of the building an attractive decorative fixture, incandescent with one 150-watt lamp, of the recessed eight- by eight-inch panel type, was used to reduce glare. The conference room of the construction company combined recessed incandescent fixtures with dimmers for softer effects.

A wood panel fluorescent fixture to accent office furniture and trim was used in both the reception room and office area. Of the four-tube type on both four- by four-foot and four- by two-foot sizes, these fixtures, too, had to be mounted at their four corners by all-thread rod to the steel joists.

In the drafting room, where close reading of architectural drawing takes place, continuous fluorescent lighting of four-foot lamps placed end-to-end was installed. Four fixtures of this type were used to supplement the flood of natural light from the windows.

Leaving lighting installations incomplete in unoccupied offices, we used a flexible type of cable in metal casing, weaving it into the steel structure. Connection boxes were mounted for future connection to the fixtures selected by tenants.

Question list for telephone callers can lessen time clock repair trips

◆ Electrical contractors who specialize in commercial electrical work, frequently involving store window lighting, parking area lighting, and other applications utilizing time clock controls, experience many trouble calls that could have been avoided if the customer had been a little more familiar with the equipment.

One contractor has greatly reduced the number of such "come fix it" call backs by maintaining a list of questions to ask telephone callers so as to eliminate the need for making a trip when the trouble may be the result of improper time clock setting or something equally simple.

In this way, the trouble can be found and corrected without need for another service call by the contractor.

Here are the questions—and all have to do with "setting":

(1) Is the dial set on the correct

time? There may have been a power failure, and for switches not equipped with reserve power, dials must be reset after such outage.

Advise customer to turn dial so that arrow on face plate of switch points to correct time.

(2) Has the a.m. portion of the dial been confused with p.m. portion? This would result in trippers being set at the wrong hours, or the dial for the incorrect time.

Advise customer to reset trippers or to correct time on dial.

(3) Are the "on-off" trippers set for the desired times? A store may want lights on at sunset but doesn't use an astronomic dial model. This means "on" times must be changed to conform with change in sun schedule (at least once a month.)

Advise customers to change times to conform with changes from Standard to Daylight Saving.

(4) If the unit has a skip-a-day wheel, has the calendar wheel been set correctly?

Advise customer on setting of spokes in proper arms of wheel.

(5) Is the dial on securely?

If in doubt, advise customer to tighten large screw in center of dial with screwdriver.

If, after covering these points, the trouble still exists, here are timesaving points for the contractor to check when he goes out on the job:

Check for blown fuses in the circuit. The time switch may not be getting a constant source of current. Replacing a fuse may be all that's needed.

Check to see if the time switch is correctly wired. See that all electrical connections are secure on the time switch, to circuits, solenoids (if used), etc.

New small-size dynamometer permits accurate torque and load measuring

◆ Torque and power loading of electric motors may now be accurately measured on the job, using a new pocket-size dynamometer announced by Micro Pump Corp., Danville, Calif.

The new compact dynamometer, used with a stroboscopic tachometer, makes it easy to obtain accurate field measurement of motor torque.

With this 2½-pound instrument it is no longer necessary to engineer and build extensive laboratory setups to duplicate actual operating conditions. The new dynamometer brings the laboratory to the job, and fits the equipment to be tested.

The device is merely slipped onto a shaft and the collet tightened by hand. Interchangeable collets accurately fit a wide range of shaft sizes. A self-contained V-belt pulley is adjustable from two to 3½ inches diameter. An adapter is provided for direct drive to hubs, spokes, gears, and the like. No tools are required; however for adjustment of pulley and adapter a small Allen wrench is provided. In operation the dynamometer is viewed by a stroboscopic tachometer while rotating.

Transmitted torque is read from the dynamometer dial, and rpm is read from the stroboscope dial. Horsepower may then be easily calculated, or read from a chart. The present model indicates torque up to 22 inch-pounds in either direction.

Micro-Pump engineers claim accuracy within one-half per cent, and state that a double spring

(Continued on page 119)

One man manages dispatcher's work and handles stock

By Milton L. Klein, President, A/C Electric Co., Inc., Washington, D. C.

◆ The simpler and more compact the planning and layout of a department the more time- and labor-saving occurs.

Because our six- by eight-foot dispatcher's office is compactly planned and situated adjacent to the stockroom, only one man is needed to staff both of these departments.

With microphone, receiver, job schedule, current job assignments to mechanics and trucks, and a city map within arm's reach, our stockroom manager who doubles for dispatcher can refer a mechanic—who has just completed a job and calls in—to the next assignment from job orders in front of him.

There is no need for running his truck back to the office to learn where he is to go next. We save gas mileage as well as a mechanic's time. A wall map enables the dispatcher to direct a calling truck to a street address by means of the shortest route with little loss of time.

The dispatcher's office concentrates records and information for one man.

Application of Code requirements

Special rules govern wiring in Class III locations for such equipment as machinery, lighting fixtures, signal systems, traveling cranes, etc.

This article should be especially helpful to the following readers:

- Electrical Contractors
- Electrical Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

By Walter R. Stone, Contributing Editor on Code Rules, Utica, N. Y.

◆ Some of the Class III wiring requirements were discussed in the last issue, and the others will be explained here.

Paragraph (a) of Section 503-6 requires that rotating electrical machinery, such as motors and generators, be of the totally enclosed not ventilated, totally enclosed pipe ventilated, or totally enclosed fan cooled type when installed in Class III, Division 1 locations except as follows:

In locations where the inspection authority has determined that no lint or flyings are likely to accumulate on or in the vicinity of such machinery except in amounts so moderate as not to constitute a hazard, and where such machinery is readily accessible for routine cleaning and maintenance, the following type of rotating machinery may be installed:

Self-cleaning textile motors of the squirrel-cage type; standard open type machines without sliding contacts, switching mechanisms, overload devices, or resistance devices; or standard open type machines having such contacts, switching mechanisms, overload devices, or resistance devices provided that these contacts, mechanisms, or devices are themselves enclosed within tight metal housings without ventilating or other openings.

But where the inspection authority is not convinced that accumulations of lint and flyings will be moderate, the totally enclosed machinery mentioned above must be used.

Paragraph (b) of Section 503-6 requires that all rotating electrical machinery in Class III, Division 2 locations be of the totally enclosed not ventilated, totally enclosed pipe ventilated, or totally enclosed fan cooled types.

In this respect, the requirements for Division 2 are more stringent than for some Division 1 locations, since the exceptions which are permitted by Paragraph (a) of this section for machinery in Division 1 locations where flyings and lint accumulations are only moderate in amount are not permitted at all by Paragraph (b) for Division 2 locations which, normally, would have less accumulations than would be expected in Division 1 locations.

Usually, however, in some justification for this rule, maintenance and cleaning is more likely to be routinely done in Division 1 areas and more likely to be neglected in Division 2 areas.

Paragraph (c) of Section 503-6 states that rotating electrical machinery of the partially enclosed or splashproof type shall not be installed in either Division 1 or Division 2 of Class III locations.

Vent pipes

Vent pipes for rotating electrical machinery and other enclosed electrical equipment are required by Section 503-7 to be of metal of not less than 24 USS gauge or of substantial noncombustible material of equal strength.

Vent pipes are required to lead directly to a source of clean outside air and, similar to vents in Class II (dust) locations, are required to be screened at the outer end to prevent the entrance of birds and bees. Vent pipes are required to be protected from rust or other corrosive influences and from physical damage.

All connections, seams, and joints must be sufficiently tight to prevent the entrance of appreciable quantities of flyings or fibers and the escape of sparks, flame, or hot particles which could ignite adjacent accumulations of combustible materials.

For metal pipes, lock seams and either riveted or welded joints may be utilized. Tight fitting metal slip joints are permitted for flexible motor connections.

Appliances

For both Division 1 and Division 2 of Class III locations, both portable and fixed appliances are required by Section 503-8 to comply with the following:

(1) Electrically heated appliances must be approved for Class III locations.

(2) The motors of motor-driven appliances must be totally enclosed not ventilated, totally enclosed pipe ventilated, or totally enclosed fan cooled.

(3) Switches, fuses, circuit breakers, and motor controllers, including pushbuttons and relays, must be provided with tight metal enclosures which are designed to minimize the entrance of flyings and fibers and which are provided with telescoping or close fitting covers. Such enclosures cannot have any holes, such as holes for mounting screws, or other openings through which, after installation, sparks or hot particles could escape and ignite adjacent combustible material.

(4) Appliances which may be moved readily from one location to another are recommended to be of the type which complies with the requirements of the location which is most hazardous.

Although the stipulation listed above in (4) is a recommendation only, if an appliance were moved into an area for which it is not approved, it would be in violation, technically, of the requirements listed above in (1), (2), or (3),

whichever is applicable. Actually, however, the supposition is academic, since all of the various types of appliances have the same requirements, as mentioned above, whether placed in Division 1 or Division 2 locations.

Lighting fixtures

Lighting fixtures installed in Class III locations, whether in Division 1 or Division 2, must comply with the following requirements by the provisions of Section 503-9:

(1) Fixed lighting fixtures are required to be designed to minimize the entrance of fibers and flyings and to prevent the escape of sparks, flames, or hot particles. Each fixture is required to be clearly marked with the maximum lamp wattage which may be used without exceeding 165 C (329 F) which is the maximum permitted exposed surface temperature under normal conditions of use.

(2) Fixtures which may be exposed to physical damage are required to be protected by suitable guards.

(3) Pendent fixtures are required to be suspended by threaded rigid conduit stems; or, as permitted by Paragraph (c) of Section 503-9, by threaded metal tubing, provided that the tubing is of equivalent thickness.

Of course, electrical metallic tubing is not of equivalent thickness, and standard pipe threads are prohibited by Section 348-7 from being used on electrical metallic tubing. No other type of metal tubing is included at the present time in the Code as an approved raceway.

Pendent fixture stems exceeding 12 inches in length must be braced within 12 inches of the lower end or be provided with a flexible connector or fitting approved for the purpose within 12 inches of the point of attachment to the supporting box or fitting.

(4) Boxes and fittings used for the support of fixtures are required to be approved for the purpose.

(5) Portable lighting fixtures are required to be equipped with handles and suitable guards. Lampholders must be of the unswitched type. Receptacle outlets or the provisions for the insertion or connection of attachment caps into portable lighting fixtures or into any part or component of such fixtures are prohibited.

In all other respects, portable fixtures must comply with the requirements for fixed lighting fixtures, such as the requirements for tight fitting enclosures and for maximum wattage markings.

Flexible cords

Flexible cords used in Class III, Division 1 and Division 2 locations are required by Section 503-10 to be of a type approved for extra hard usage containing an additional grounding conductor with a green finish. Cords are required to be connected to terminals in an approved manner and supported by clamps or similar devices to prevent tension on terminal connections.

Receptacles and attachment caps installed in Division 1 and Division 2 of Class III locations are required by Section 503-11 to be of a

---

Code test questions

1. Pendent lighting fixtures in Class III locations may be suspended by threaded metal tubing. True or false?

2. Fixed lighting fixtures in Class III locations are not required to be provided with guards unless they may be exposed to physical damage. True or false?

3. Portable lamps in Class III locations are not required to be provided with handles. True or false?

4. Storage battery charging equipment in a Class III location is not required to be in a separate room provided that it is adequately ventilated from a point outside of the building. True or false?

5. The power supply to the contact conductors for a traveling crane which operates over accumulations of flyings is required to be ungrounded. True or false?

6. Where, in the judgment of the Code enforcement authority, only moderate accumulations of lint and flyings will be likely to collect on or in the vicinity of a motor and where such a motor is readily accessible for routine cleaning and maintenance, a standard open type motor without sliding contacts and without centrifugal or other types of switching mechanisms is permitted to be installed:

(a) in a Class III, Division 1 location but not in a Class III, Division 2 location.

(b) in a Class III, Division 2 location but not in a Class III, Division 1 location.

(c) in any Class III location.

Which is correct? a? b? or c?

7. Partially enclosed or splash-proof type motors:

(a) may be installed in Class III, Division 2 locations but not in Class III, Division 1.

(b) may be installed in any Class III location.

(c) shall not be installed in any Class III location.

Which is correct? a? b? or c?

8. Ventilating pipes for rotating electrical machinery in Class III locations are required to:

(a) lead directly to any source of clean air.

(b) lead directly to a source of clean air outside of the building.

(c) lead directly through, and not less than 18 inches above, the roof.

Which is correct? a? b? or c?

9. Receptacle outlets and attachment caps installed in Class III locations are required to be:

(a) of the explosion-proof type.

(b) of the type providing for connection to the grounding conductor of the flexible cord and so designed that connection to the supply circuit cannot be made or broken while live parts are exposed.

(c) of the dust-ignition-proof type.

Which is correct? a? b? or c?

10. In a local loudspeaker intercommunication system, resistors, transformers, and choke coils installed in Class III locations which may carry other than voice currents are required to be provided with enclosures:

(a) of the explosion-proof type.

(b) with telescoping or tight fitting covers and without openings, such as holes for mounting screws, through which, after installation, arcs, sparks, or hot particles could escape and ignite adjacent combustible material.

(c) of the dust-ignition-proof type approved for Class II locations.

Which is correct? a? b? or c?

Correct answers will be found at end of article on page 119.

Correction:

The hazardous location referred to in Test Question No. 8, July issue, page 40, should have been Class II, Division 2 instead of Class I, Division 2. The editors regret this typographical error.

grounding type and so designed that the connection to the current supply cannot be made or broken while live parts are exposed. This is frequently accomplished by incorporating interlocking switches which are so designed that the switch cannot be turned on until the device is in place, and the device cannot be removed until the switch is off.

Another frequent method is by designing the device in such a way that the prongs first must be inserted, then turned about a quarter turn, and finally inserted a further amount before current contact is made.

To remove, the current is broken by the first withdrawing action, but the unit must be turned the quarter turn in the opposite direction and withdrawn again before any bare parts are exposed and the device is removed.

Signal systems, etc.

Signal, alarm, remote-control, and local loudspeaker intercommunication systems which are installed in Division 1 and Division 2 of Class III locations are required by Section 503-12 to conform to the following rules:

(1) Rigid metal conduit, electrical metallic tubing, or type MI cable with approved terminal fittings is required to be used as the wiring method where insulation damage or breakdown could result in arcs, sparks, or high temperatures.

Conduit or electrical metallic tubing is permitted to have a maximum conductor fill of 40 per cent of the cross sectional area of the raceway, but there is no limit to the number of conductors permitted as long as the 40 per cent fill is not exceeded.

Where there is no exposure to severe physical damage or where limited flexibility is desired, flexible cord of a type approved for extra hard usage is permitted.

(2) Switches, circuit breakers, fuses, relays, and contactors which may interrupt current, other than voice currents, and current-interrupting contacts for bells, horns, howlers, sirens, and other devices to which the interruption of current could produce arcs or sparks are required to be provided with enclosures approved for the location except that general-purpose enclosures may be used where the current-interrupting contacts are immersed in oil or where they are within a chamber which is sealed to prevent the entrance of dust, fibers, or flyings.

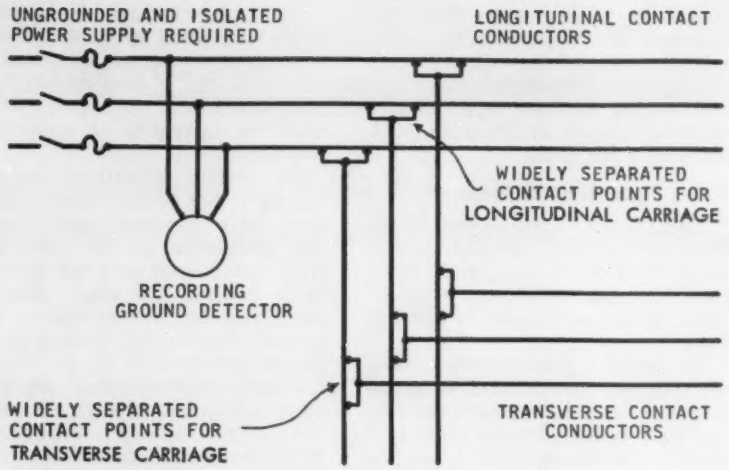

UNGROUNDED AND ISOLATED POWER SUPPLY REQUIRED
LONGITUDINAL CONTACT CONDUCTORS
WIDELY SEPARATED CONTACT POINTS FOR LONGITUDINAL CARRIAGE
RECORDING GROUND DETECTOR
WIDELY SEPARATED CONTACT POINTS FOR TRANSVERSE CARRIAGE
TRANSVERSE CONTACT CONDUCTORS

Fig. 1—Traveling electric cranes, hoists, and cleaners for textile machinery, when used over accumulations of combustible fibers and flyings in Class III, Division 1 or 2 locations must comply with special rules quoted in the text and those illustrated here. The recording ground detector, operating through relays, gives alarm and disconnects supply before the fault current is sufficient to ignite fibers. Current collectors must have at least two separate contact surfaces to prevent arcing.

(3) Resistors, transformers, and choke coils which may carry current, other than voice currents, as well as rectifiers, thermionic tubes, and other heat-generating equipment are required to be provided with enclosures approved for Class II (dust) locations.

(4) Rotating machinery is required to be totally enclosed not ventilated, totally enclosed pipe ventilated, or totally enclosed fan cooled and is required to be dust-ignition-proof and approved for Class II locations.

As mentioned, these requirements for signal, alarm, remote-control, and local loudspeaker systems are required for Division 2 as well as for Division 1 in Class III locations. In Class II locations, however, somewhat less strict rules are permitted in some instances in Division 2 than in Division 1 as discussed in this department last month.

It may be noticed that some equipment for some uses when used in Class III is required by the Code to be approved for Class II locations; or, to put it another way, the requirements are the same for both, so the equipment can be listed for Class II.

Traveling equipment

Traveling electric cranes, electric hoists, traveling cleaners for textile machinery, and similar equipment, when used over accumulations of combustible fibers and flyings in Division 1 and Division 2 of Class III locations, is required by Section 503-13 to comply with the following rules:

(1) The power supply contact conductors are required to be ungrounded and isolated from all other systems.

These contact conductors are required to be equipped with a suitable recording ground detector which, in the event of a phase-to-ground fault, will give either an alarm and automatically de-energize the contact conductors or will give both an audible and a visual alarm and maintain both alarms as long as the system remains energized and the ground fault remains uncleared.

Ground faults occur most frequently between contactors and ground through damp accumulations of flyings or fibers around insulators and supports. An ungrounded system helps prevent heavy current flow when ground faults occur. These detectors and relays should be connected to the transverse contact conductors as well as to the longitudinal or main contact conductors.

The contact conductors must be guarded or so located that they will not be accessible to unauthorized persons. They are required to be provided with protection against accidental contact with foreign objects.

(2) Current collectors are required to be so designed as to pre-

vent the escape of sparks or hot particles which could ignite flyings or fibers which may have accumulated on or near the conductors or collectors. To reduce normal sparking, not less than two separate contact surfaces must be provided for each contact conductor so that even in the event of imperfect alignment, contact will always be made.

Only one contactor instead of two or more could result in making and breaking of the contact. This would result in dangerous arcing as well as jerky operation. All contact conductors and current collectors are required to be provided with a reliable means of preventing accumulations of fibers or flyings.

A fine print note recommends that where the distance of travel permits their use, extra hard usage flexible cords and take-up reels should be used to supply current to traveling cranes, hoists, textile machinery washers, and similar devices which operate over accumulations of lint and flyings.

Where these are used, extreme care must be exercised to prevent damage to such cords which could result in hazardous arcing. See Figure 1.

Switches, etc.

(3) Switches, circuit breakers, fuses, motor controllers, relays, pushbuttons, and similar devices used in conjunction with traveling cranes, etc., are required to be provided with tight metal enclosures which are designed to minimize the entrance of fibers and flyings.

Such enclosures must have telescoping or tight fitting covers and be without openings, such as mounting screw holes, through which, after installation, sparks or hot particles could escape and ignite adjacent combustible material.

(4) Where not in the same enclosure with switching mechanisms, transformers and impedance coils which are used in conjunction with control equipment for motors, generators, and appliances are required to be provided with tight metal housings without ventilating openings.

Resistors which are used in conjunction with such control equipment are required to be provided with dust-ignition-proof enclosures approved for Class II locations except as follows:

Where the maximum operating temperature of the resistor will not exceed 120 C (248 F), non-adjustable resistors and resistors which are a part of an automatic time-sequence starting device may have tight metal enclosures without ventilating openings.

(5) In Class III, Division 1 locations where transformers, impedance coils, and resistors are used in conjunction with control equipment for motors, generators, and appliances and where they are in the same enclosure with switching devices of such control equipment and are used only for starting duty or for short time duty, the enclosures must be of the tight metal type and provided with tight fitting or telescoping covers and be without openings, including mounting screw openings, through which, after installation, sparks or hot particles could escape and ignite adjacent combustible material.

Electric trucks

Although electric trucks are classified under a different category and therefore do not have requirements for them listed in the NEC, Section 503-14 does state that such trucks, when used in Classs III locations, shall conform to NFPA requirements for such vehicles (NFPA Pamphlet No. 505).

Such trucks which have unenclosed d-c controls and ferrous metal or non-conducting rubber tires would, of course, constitute a hazard. Ferrous metal causes sparks by friction, and non-conducting rubber builds up dangerous static charges. Only trucks which comply with NFPA Standard No. 505 should be admitted to Class III areas.

Charging equipment

Storage battery charging equipment, where installed in Division 1 or Division 2 of Class III locations, is required to be enclosed within separate, well-ventilated rooms. These battery charging rooms are required by Section 503-15 to be built of sturdy non-combustible material or lined with such material. They must be so designed that all lint, fibers, and flyings will be effectively excluded.

Except for current collectors and contact conductors on traveling cranes, hoists, and textile machinery washers discussed above, no exposed live parts are permitted in any Class III location.

Wiring and equipment in Class III, Division 1 and Division 2 locations are required by Section 503-17 to be grounded as follows:

(1) All exposed non-current-carrying metal parts, such as motor frames, fixtures, appliances, boxes, cabinets, and raceways are required to be grounded by a grounding conductor or by a grounded metal raceway system.

(2) Locknuts and bushings or

(Continued on page 119)

Code interpretations clarify rules on wiring

◆ An interpretation of a section of the National Electrical Code has been released by the National Fire Protection Association as of June 23, 1961, it was announced by the National Electrical Code Committee of the NFPA.

The interpretation, developed through the established committee procedure in response to requests, has been reviewed and released by the NFPA Electrical Correlating Committee.

The subject of the interpretation concerns the proper installation in multi-family type dwellings of a stationary domestic dishwasher incorporating a motor rated in excess of 1/8 horsepower and a heater rated in excess of 300 volt-amperes.

The official text of the interpretation follows:

Interpretation No. 469

Statement: A domestic dishwashing machine which incorporates a motor rated in excess of 1/8 horsepower and a heater rated in excess of 300 volt-amperes, is installed as a stationary appliance in a multi-family type dwelling. The branch circuit switch or circuit breaker is installed on another floor not within sight of the motor controller of the appliance, but is readily accessible to the user.

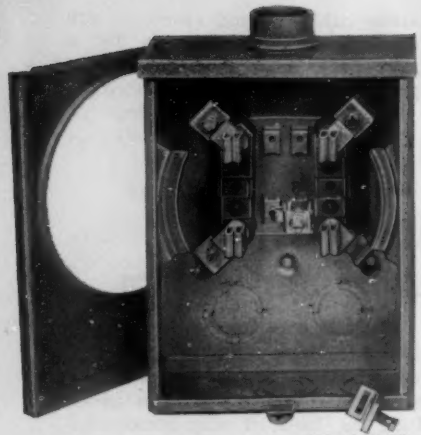
Question No. 1:—If the branch circuit switch or circuit breaker is considered as providing the disconnect means required in Section 422-16, paragraph b, must it meet the requirements of Section 422-19?

Answer: Yes.

Question No. 2: — Would the branch circuit switch or circuit breaker be required to comply with the provisions of Section 430-102?

Answer: Yes.

Comment: If the unit switch provided as a part of the dishwasher were considered as the disconnect means, Section 422-17 (a) would apply.



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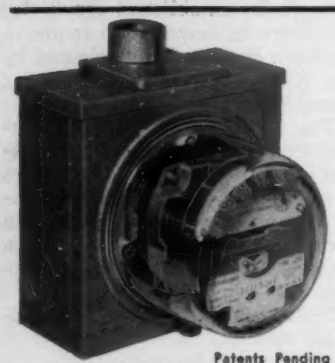

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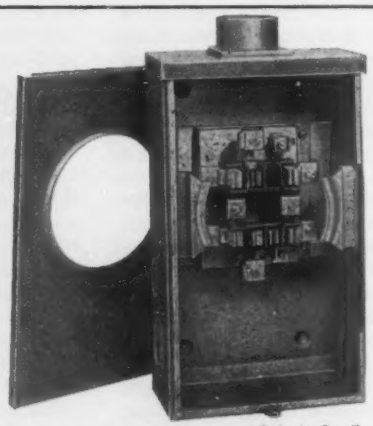

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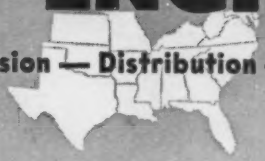

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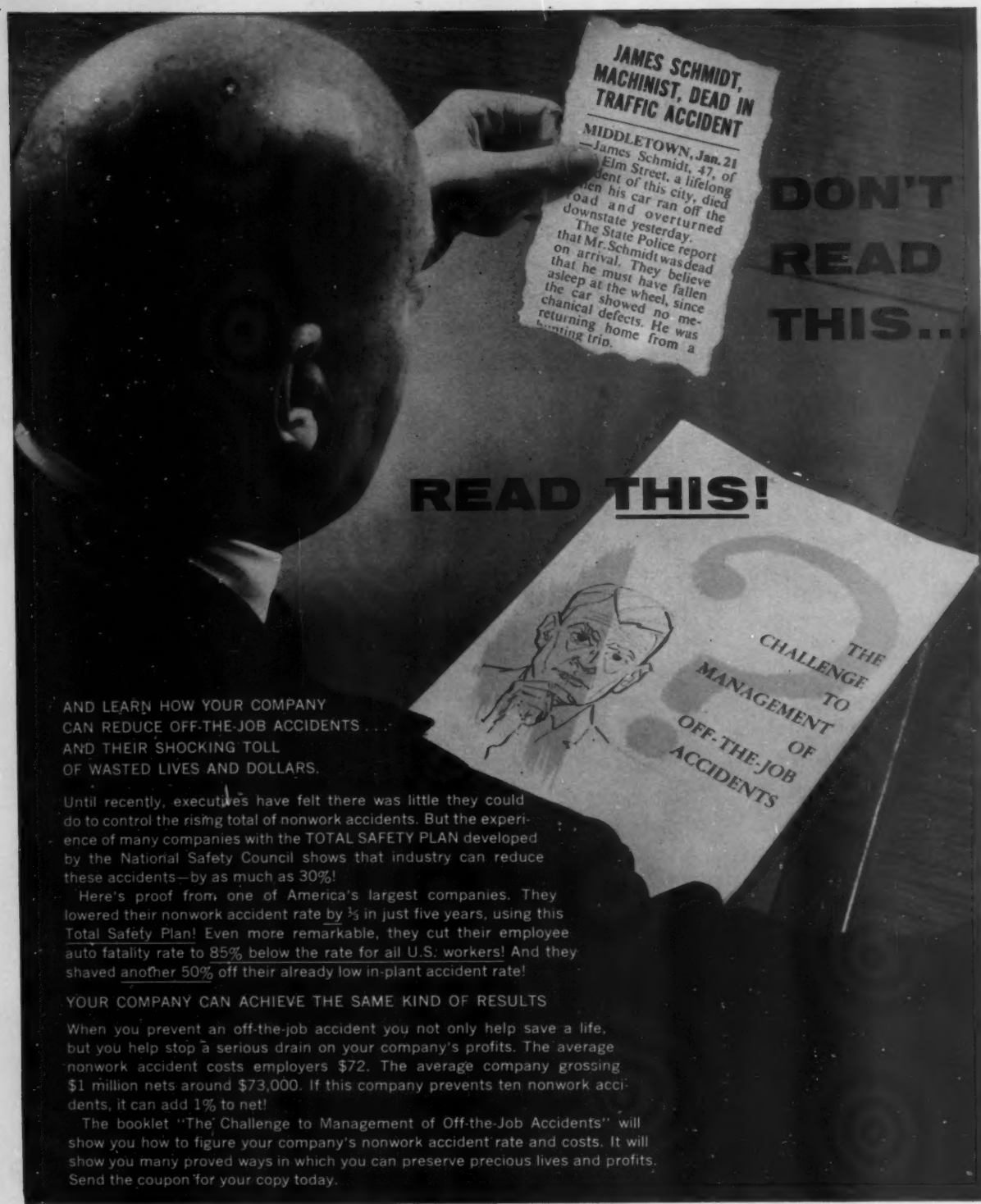
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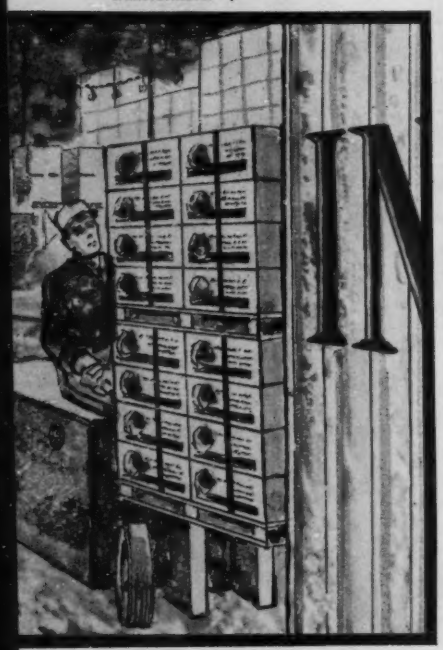

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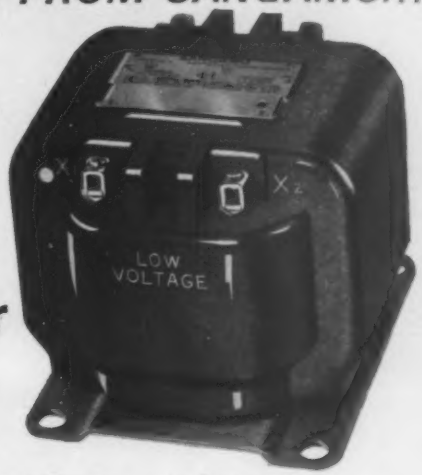
the smallest, lightest potential transformer of its kind T-6

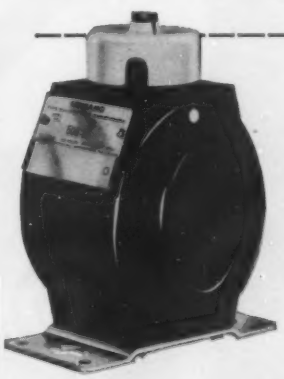


First the BH-6 current transformer . . . and now, a companion potential transformer—the T-6. Compact, epoxy-molded and encapsulated for indoor-outdoor 600 volt class service. Accuracy classification is 0.3 at W and X burdens; actually, the design allows 0.3 accuracy for burdens of two watthour meters, phase-shifting transformer, and demand register (approximately 35 volt amperes).

Impulse level of the T-6 is well in excess of 10 kv full wave, yet it weighs less than 14½ pounds. Liberal cross-section in the secondary winding accounts for a thermal burden rating of 500 volt amperes at 30°C ambient.

The T-6 is small. It measures only 5¾" x 5¼" x 4½". Standard ratios are completely color-coded as follows: 2:1, red, 2.5:1, yellow, 4:1, blue, 5:1, gray. It's built to last, too . . . right down to its alondined and painted aluminum base. Naturally, it meets all of the applicable NEMA standards for indoor transformers of the 600 volt class.

Our suggestion: check full particulars of the T-6 with your Sangamo Representative.



Sangamo BH-6 current transformers lead their class, too. Use them . . . take full advantage of their dual-range feature (a Sangamo first). Eliminate transformer changeouts due to load growth.

BH-6 transformers are epoxy-molded, color-coded, completely encapsulated, lightweight. Large conductor goes through that *Big Hole* easily. Available for all indoor or outdoor applications in a rating for your specific need.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

PX61-1

For more details on above items, use reply card on page 21

LOWER TOTAL OWNING COST WITH THE . . .

PERMALEX® 65 DISTRIBUTION TRANSFORMER

Shown above is General Electric's new 65C distribution transformer—the PERMALEX 65. It costs less to purchase, to install, to operate, and to change out. *This* is Lower Total Owning Cost.

Now all utilities can take full advantage of General Electric's high-temperature Permalex transformer insulation system...with no change in their operating practices. Your G-E sales representative has the complete story.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Forty pounds lighter and five inches shorter: this is how the 25-kva, 7200-volt PERMALEX 65 distribution transformer compares with its 55/65C predecessor. Similar reductions in size and weight are made on all PERMALEX 65 transformer ratings. This new, smaller, and lighter transformer offers substantial savings to electric utilities on "joint use" poles, as well as in installation, changeout, and inventory costs.

SMALLER SIZE, LIGHTER WEIGHT

55/65 C		65 C
43 inches		38 inches
450 lbs.		410 lbs.

Redesign of General Electric's Permalex transformer into the single-rated PERMALEX 65 design also brings new reductions in utility distribution-system operating cost. Copper and iron losses have been lowered and, through lower impedance, regulation is improved. These improvements will help utilities meet increasing loads and their requirements for better voltage and service continuity—with greater economy and reliability.

LOWER OPERATING COSTS

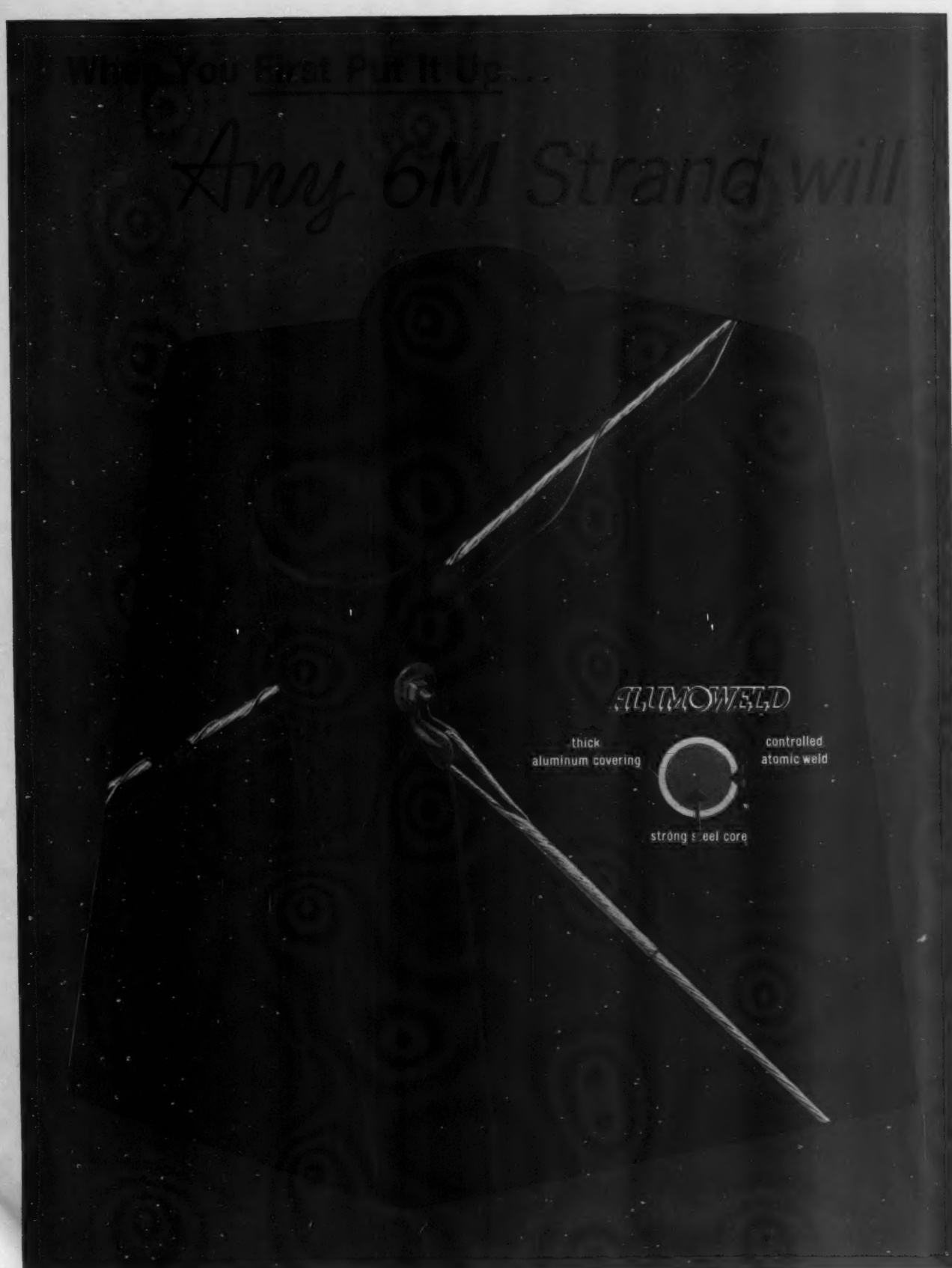
With the introduction of the PERMALEX 65 distribution transformer, General Electric continues its program of passing manufacturing cost savings on to utilities in the form of lower purchase price. Chart of popular 25-kva, 7200-volt, no-tap rating (below) illustrates how G.E.'s initiative in sharing cost savings has lowered utility capital expenditure on distribution transformers since 1957. Price reductions have been made on all PERMALEX 65 transformers in preferred-kva ratings.

LOWER PURCHASE PRICE

482-31

When You First Put It Up...

Any 6M Strand will



support 6,000 lbs...

TIME BRINGS OUT THE DIFFERENCE

RUSTABLE STRAND GETS WEAKER— ALUMOWELD STRAND KEEPS ITS STRENGTH

When you buy strand you want the strength you specify—and you want that strength to last. So why waste good money on ordinary strand that can't resist corrosion—that starts to rust away and weaken *after* you install it. Unlike rustable strand, Alumoweld's initial strength remains permanent year after year.

With its *thick* covering of aluminum—25% by area—permanently welded to a strong steel core, Alumoweld gives you the same high resistance to corrosion as solid aluminum. It's made by the exclusive atomic-welding process in which the ductile weld remains permanent under all operating conditions. Corrosive elements can't reach the steel core because of the durable protection of the *thick* aluminum covering.

Diameter for diameter, Alumoweld Strand has the same strength as extra-high-tensile steel—yet, it weighs less and is easier to install. Its initial cost is surprisingly low. In fact, because it will stay up far longer, Alumoweld Strand will actually *cost less* as the years go by.

Alumoweld Strand gives you performance where it counts—on the job! Send for Engineering Bulletin E. D. 3000 and get the full story on Alumoweld's important, money-saving advantages. You'll see why Alumoweld Strand is preferred by so many efficiency-minded, cost-conscious companies.

Supplies of Alumoweld Strand are available for immediate shipment from our warehouses in New York, Chicago, Pittsburgh and Memphis.

COPPERWELD STEEL COMPANY WIRE AND CABLE DIVISION *Glassport, Pa.*

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

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LOADED with extra value

ALUMOWELD

guy and messenger strand

For more details on above items, use reply card on page 21

Heat load analyzing meter panel

Sales and meter personnel cooperate to procure data

By Robert M. Ballard, Division Meter Superintendent, Georgia Power Co., Rome, Ga.

◆ Living better electrically is a fact for occupants of the more than 5,200 all-electric residences and commercial buildings served from Georgia Power Company lines.

Many satisfied owners of these all-electric heating and air-conditioning installations are telling the good news. This advertising medium of satisfied owners is recognized for its great value in promoting additional sales and use of electrical heating and air-conditioning equipment.

As one means of maintaining and further increasing the power of this selling aid, the Georgia Power Company gives special attention to customer inquiries regarding the operating characteristics of the various types of air-conditioning equipment.

The sales and operating departments have often found that their common interest in the customer and his electrical equipment was best served by working together. The meter department has frequently cooperated with the sales engineers in making special memo meter installations to obtain operating data. The installation described herein is a typical example of such memo metering.

This joint project of the sales and meter departments of Georgia Power illustrates what can be accomplished through interdepartmental cooperation and the proper utilization of available know-how and material within the company.

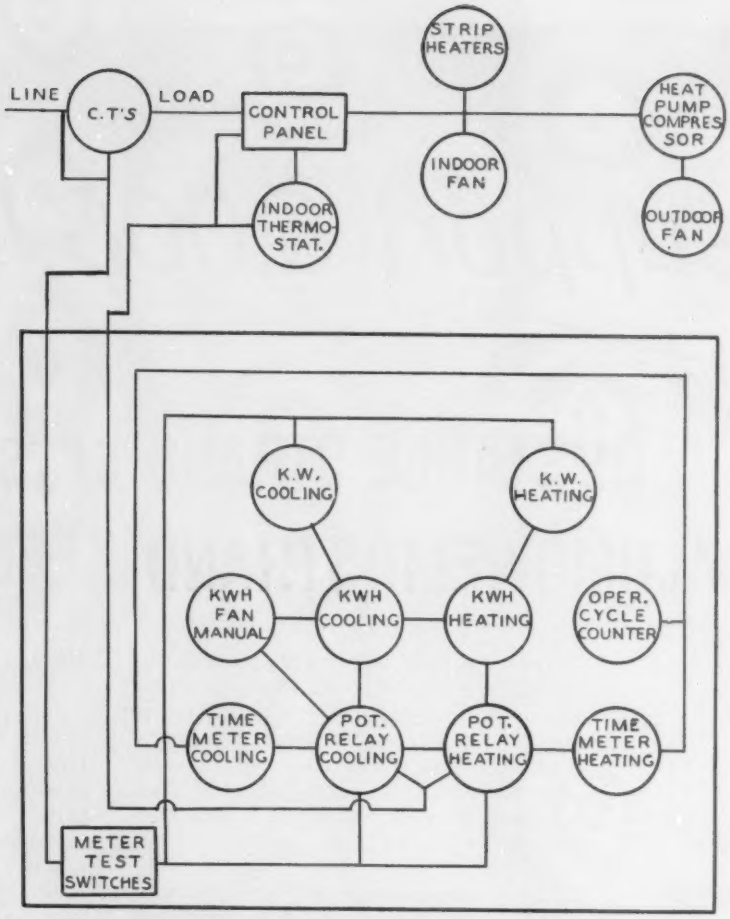


Fig. 1—Shown are the interconnections of test panel components, heat pump circuit, and control panel used for obtaining the operating data.

What has been described as a unique and somewhat ingenious memo meter panel was recently installed as a result of a customer's inquiry for specific data regarding the power requirements of an all-electric building that is air conditioned year-round by a heat pump.

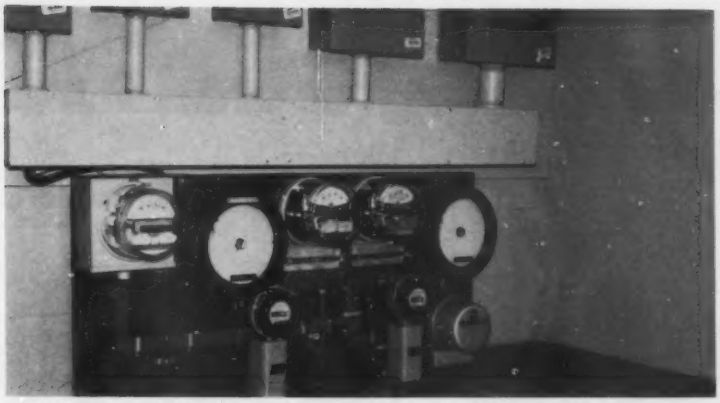
The first step in making this memo installation was an on-site consultation held by the division meter superintendent and the commercial sales engineer to discuss the various data needed and to determine the method and approximate cost of installing memo meters on the circuits which were involved.

The physical layout of the customer's equipment determined the location and the type of memo meter panel that was most desirable. A compact, portable panel was then designed to meet the specific requirements. The panel was preassembled before delivery and installation in the customer's building.

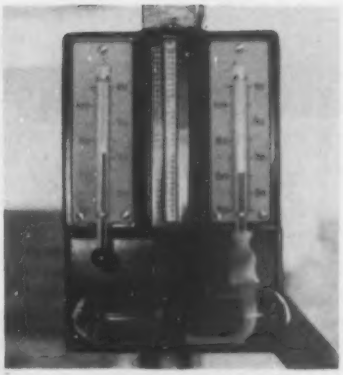
Three miniature through type current transformers were installed in the customer's wiring trough to facilitate connections for metering only the circuits supplying the heat pump compressor, auxiliary heaters, outdoor fan, and indoor fan. Short lengths of relay and meter control cables were used to connect the panel to the customer's wiring and to the current transformers.

Inasmuch as the compressor of a heat pump performs the dual function of cooling and heating, it was a challenge to ingenuity to accomplish separate metering of the respective cooling and heating cycles. This was accomplished by interlocking through suitable relays the potential coils of the memo meters.

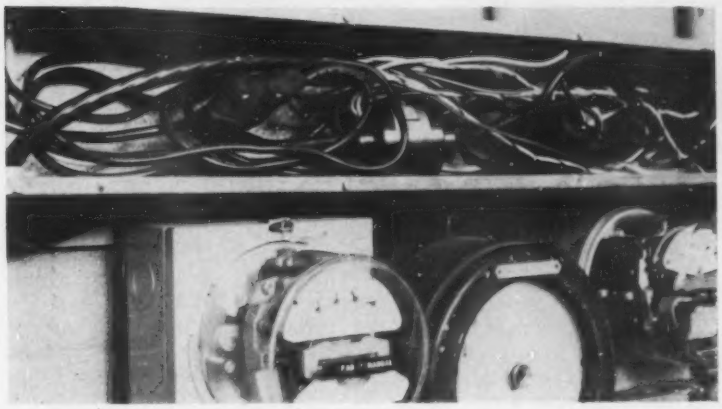
These relays were connected so as to be actuated by the 24-volt control circuits of the heat pump



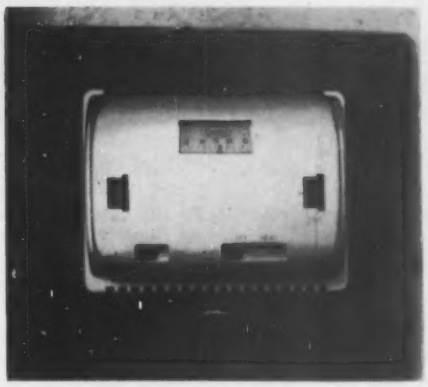
Installed beneath the wiring trough, the panel has a neat appearance.



Indoor temperature and humidity readings are noted twice a day.



Meter cable enters bottom of trough at left and current transformers accommodate wires of circuits to be metered. Potential relay cable continues at left above trough to indoor thermostat in adjoining room.



The indoor thermostat provides terminal connections for the control cable leads from the respective cooling and heating potential relays on the memo panel.

and were connected to the respective cooling and heating control terminals of the indoor thermostat.

Figure 1 shows a one-line diagram of the connections of the component parts and the accompanying photographs show the installed panel, etc.

Of prime importance was the installation of the memo metering in such a manner that it would not affect the normal operation of the heat pump during the period the memo meters were to be left in place. Every consideration was given to maintain customer satisfaction and to obtain readings that truly represented normal operating conditions.

To prevent any change in the normal current flow in the anticipator circuit of the heat pump's automatic changeover thermostat, particular care was taken in selecting the point for making connections to the 24-volt control circuit that was to supply the operating coils of the memo panel potential relays.

One lead of each potential relay operating coil was connected to the respective heating or cooling control terminal of the indoor thermostat and the other leads were connected to the load side of the time delay relay that controls the standard strip heater circuit.

This particular connection avoids a current change in the anticipator circuit but it causes a five-second delay in the operation of the memo panel potential relays each time the compressor starts.

However, this is not objectionable because during this delayed period approximately 50 per cent of the power consumed is registered on the indoor fan single-phase memo meter and, therefore, can be fully accounted for by a minor calculation.

The only change made in the customer's equipment was the addition of a low-voltage transformer for added capacity to handle the burden of the potential relay coils. This transformer was of the same type and capacity as the low-voltage transformer supplying the control circuits of the compressor unit, and was contributed by a representative of the heat pump manufacturer.

The additional transformer was connected in parallel with the equipment's original transformer and was mounted adjacent to it. With the exception of this transformer, the two potential relays, one 240-volt solenoid, and the two time meters, all equipment used on the test panel consisted of stock items of the utility.

Approximately 30 man-hours were required to assemble, wire in, and install the panel.

When originally installed, the panel assembly did not contain

(Continued on page 116)

Establishing and holding a standard

Manufacturers must maintain and be able to transfer an accurate

By John Philbrick, Engineer, Meter Dept., General Electric Co., Somersworth, N. H.

◆ In the last two decades, the importance of maintaining accurate standards of the watthour has increased tremendously for both watthour meter manufacturers and electric utility companies.

Improvements in the quality of watthour meters have resulted from new designs and manufacturing techniques and permitted reduction in utility operating costs. Over and above the mechanical performance aspects, an important manifestation of meter quality is its accuracy of registration.

Thus, in order to reproduce meters of high registration accuracy, the manufacturers must maintain and be able to transfer a very precise and accurate standard of the watthour. Further, the value of the watthour should agree with that of the National Bureau of Standards as a recognized referee.

In recent years many electric utility companies have accepted the concept of statistical sample testing of new meters as a means of reducing acceptance costs. To make this effective, accurate standards of the watthour should be maintained by the utility. Otherwise it may be needlessly readjusting or rejecting good meters because its watthour does not agree with that of the manufacturer.

As a result of the competitive need to maintain an accurate standard of the watthour, the meter manufacturers have spent considerable time and effort to establish highly reliable standards.

Actually, there are many possible combinations of equipment that can be used to provide a standard of the watthour, but the purpose of any group of equipment is ultimately to refer the measurement of energy—the watthour—to the standard values of voltage, resistance, and time.

Since the watthour meter integrates time and power, it would seem logical to calibrate watthour meters by holding a constant load and noting the elapsed time for a number of disc revolutions. This was the method that was used years ago when relatively few meters had to be calibrated. However, this method was tedious and time consuming and the accuracy was limited to how well one could hold load and measure time.

Easier method

A much easier and precise method was developed in which one meter of known calibration was used as a reference standard and all other meters connected to the same load were compared to it. As the need for greater precision and accuracy increased, this comparison method was developed further and portable standard watthour meters were built.

These standards have multiple potential and current ratings and resettable registers to permit readings to be taken to within 0.01 of a revolution.

The utility company with a large number of these portable standards is then faced with the problem of determining their registration accuracy. The obvious answer would be to extend the comparison method one more level and compare the portable standards against one master standard.

This standard must ultimately be checked either by the watt-time method, or by comparison with the National Bureau of Standards, or both.

The rest of this discussion will explain the way in which the General Electric Company's Meter Department maintains the value of the watthour in its operation at Somersworth, N. H. The equipment and methods to be explained would be perfectly applicable, in whole or in part, to others desiring to establish and maintain the standard watthour.

The block diagram, Figure 1, shows the basic units making up the watthour standard console. The heart of the whole system is the precision watthour standard which consists of a temperature controlled box enclosing three G-E type IBL-10 watthour meter standards. These standards are rated at 120 volts, five amperes, 60 cycles, and each is equipped with a light source and phototube unit working in conjunction with a single hole in each of the rotor discs.

Thus, impulses are received from IBL-10's at the rate of one impulse per revolution of the rotors. Each IBL-10 phototube unit can be selected in turn to feed impulses to a photoelectric watthour meter tester to start and stop the portable standard on test.

The basic potential and current ranges of the IBL-10's are extended through the use of precision potential and current transformers providing for 24 test voltages from 96 to 720 volts and 32 test currents from 0.25 to 200 amperes. For any combination of these voltages and currents, the IBL-10's are operating at 100 per cent rated voltage and current.

Therefore, registration accuracy of the IBL-10's has to be determined for only two basic points; namely, 120 volts, five amperes, 1.0 power factor, and 0.5 power factor current lagging.

The current circuit is supplied by means of a loading transformer and Variacs arranged in a coarse and fine control arrangement. Reactive loading is used with capacitors for phase correction.

The potential circuit is fed by a potential supply transformer whose primary is connected to a heavy-duty power amplifier. The input of the amplifier is a low-level signal from a phase shifting network which provides continuous phase shifting through 180 degrees. Thus, the equipment can be used from zero power factor lag through unity to zero power factor lead if desired.

During comparison tests of portable standards, the load conditions are held approximately (within 0.25 per cent) by means of the type P-3 voltmeter, ammeter, and

watthour

and exact standard

wattmeter. When watt-time calibration checks are performed on the IBL-10's, the Elliott Brothers a-c/d-c comparator is used to measure load precisely (within 0.01 per cent).

A-c/d-c comparator

The Elliott Brothers a-c/d-c comparator is a null balance, two-element, precision volt-ampere-wattmeter with an equivalent scale length of 18 feet. The null balance is achieved by balance of torques of the two elements: an ironless dynamometer measuring instrument and a permanent magnet moving coil control instrument, the moving coils of each on a common shaft and operated in the position of zero mutual inductance. Means are provided for self-standardization and temperature compensation.

Because of the very high sen-

This is the precision watthour standard console at the General Electric Meter Dept., Somersworth, N. H. From left, to right, the first cabinet contains the Knopp Uniload test set for load current selection at the top, the lower panel having the various plugs and jacks for connections to the meter being tested. The second cabinet has the G-E photo-electric watthour meter tester with switching and connections for the IBL-10 phototube units. The two center cabinets have the potential selection at the top, controls for adjusting line voltage, potential, current, and power factor in the lower section, and the Altec-Lansing amplifier in the bottom section. The type P-3 voltmeter, ammeter, and wattmeter are flush-mounted in the bench top behind the author, John Philbrick. The next cabinet houses the Elliott Brothers a-c/d-c comparator and control box and at the extreme right the Leeds & Northrup K-2 potentiometer and galvanometer can be seen.

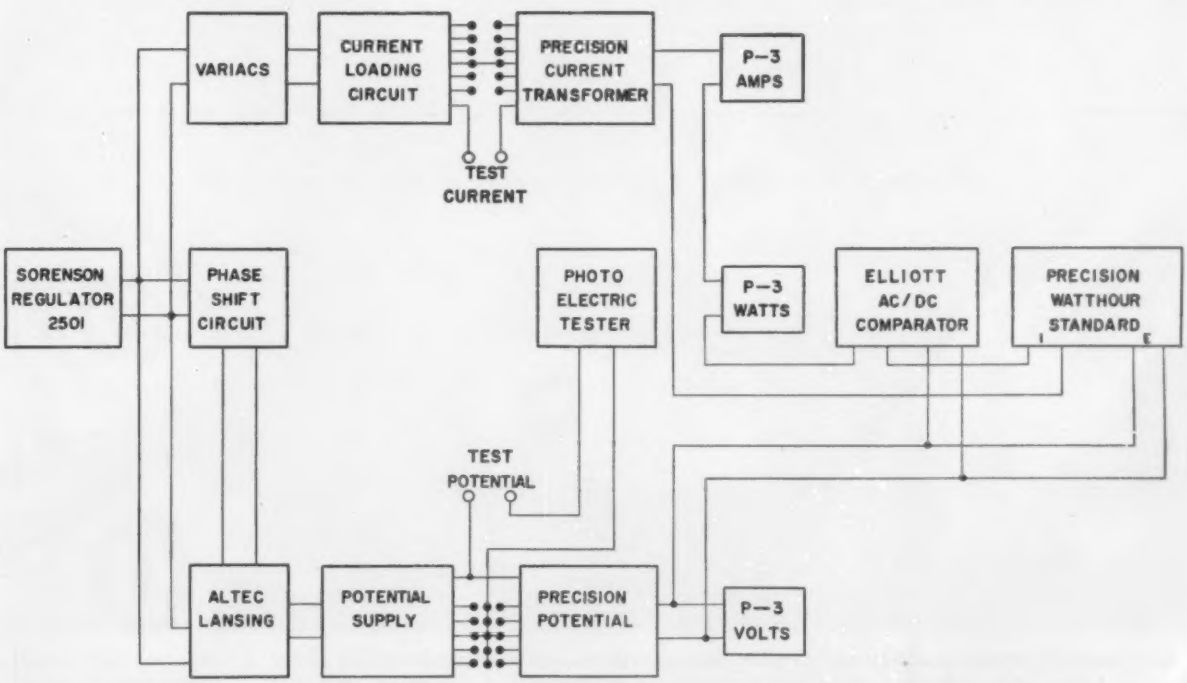


Fig. 1—These basic units make up the watthour standard console used by the Meter Department at General Electric.

sitivity of the a-c/d-c comparator and the need for extremely close regulation of the load, the entire equipment is fed by a Sorenson model 2501 regulator which is capable of 0.01 per cent regulation.

In the design of the equipment, particular attention was paid to all possible sources of error that would amount to 0.01 per cent or more and means taken to reduce these errors to a minimum. A few examples of the extent of this work should indicate the need for close scrutiny in the design and maintenance of such equipment.

Timing errors checked

Timing errors of the photoelectric tester were checked with electronic time interval meters and the relay adjustments were "touched up" to reduce timing errors below 0.01 per cent in a normal 36-second test. A double check was performed by comparing readings on two IB-10 standards with and without the use of the photoelectric tester.

These checks were performed on two photoelectric testers over a period of several months before installation. At the time of installation, the one showing the better results was installed and the other held as a replacement.

Potential circuit resistance is a never-ending problem in watthour meter calibration, especially at low power factor loads. In this equipment the wire sizes used in the potential circuit are Nos. 6 and 8. The different sizes are used not only to reduce the resistance to a very low value, but also to balance different portions of the potential circuit.

An indication of the necessity for this refinement can be seen by considering the effect if the whole potential were wired with No. 12 wire. The total loop length is about 30 feet and the resistance introduced would affect 0.5 power factor calibration by about 0.03 per cent.

By using the heavy wire and all soldered connections, the errors from this source are held to less than 0.01 per cent at 0.5 power factor.

Wiring in the direct current side of the a-c/d-c comparator was designed and checked for low thermal EMF's, since a 0.1-millivolt error would amount to 0.01 per cent in this circuit. The results of checks showed errors to be 0.001 per cent or less.

Waveform distortion

The problem of waveform distortion was the most difficult to contend with since there was very little information to indicate what level of distortion could be tolerated. The figure of 1.0 per cent total harmonic distortion was used as a goal for both the potential and current circuits.

This figure was chosen for two reasons: this is maximum value the National Bureau of Standards would allow in their equipment and tests we had performed indicated that this value would assure us of less than 0.05 per cent error at either 1.0 or 0.5 power factor loads. This meant that some means had to be used to reduce the inherent distortion from the Sorenson regulator.

In the current branch, the current loading circuit and precision current transformers are all part of a Knopp Uniload current set. This equipment uses reactive loading plus capacitors to improve the power factor reflected to the Sorenson regulator.

It was claimed that waveform distortion would be somewhat improved with this system and, fortunately, this is the case. The resulting distortion in the current circuit was measured and found to be 0.8 per cent.

The heavy-duty amplifier is an Altec-Lansing model 260A which is capable of 200 watts at less than one per cent distortion. By using considerable filtering in the input to the amplifier, the potential circuit distortion is also one per cent or less.

Corrections to be applied to the precision transformers, the a-c/d-c comparator, and the K-2 potentiometer used with the comparator have been determined at the National Bureau of Standards and are applied wherever they amount to 0.01 per cent or more.

(Continued on page 118)

Table I—Summary of class 100 and class 200 calibration points*

			IB-10 #135			IB-10 #146			IB-10 #344			AVG
VOLTS	AMP	P.F.	NBS	GE	DIFF	NBS	GE	DIFF	NBS	GE	DIFF	DIFF
240	15.0	1.0	100.34	100.36	+0.02	100.35	100.35	0.00	100.13	100.18	+0.05	+0.02
240	1.5	1.0	100.43	100.45	+0.02	100.36	100.37	+0.01	100.13	100.19	+0.06	+0.03
240	30.0	1.0	100.36	100.37	+0.01	100.49	100.46	—0.03	100.17	100.22	+0.05	+0.01
240	3.0	1.0	100.36	100.40	+0.04	100.47	100.46	—0.01	100.17	100.20	+0.03	+0.02
240	15	0.5	100.47	100.51	+0.04	100.30	100.34	+0.04	100.13	100.19	+0.06	+0.05
240	30	0.5	99.95	100.01	+0.06	100.15	100.18	+0.03	99.96	100.00	+0.04	+0.04

*Semiannual intercomparison check with National Bureau of Standards, spring 1961.

Unitized metering switchboard takes twice the meters in half the space

◆ A new-design, free-standing metering switchboard, designated the Uni-Power, which accommodates nearly twice as many meters in half the space required for a comparable quantity of wall-mounted units, and which reduces installation cost and time, is now being marketed nationally by I-T-E Circuit Breaker Company's Walker Division of Atlanta, Ga.

Each section of the compact, new metering switchboard is a self-contained, free-standing unit on which meters may be mounted front and back. Each section measures only 32 inches wide, 13½ inches deep, and 77½ inches high.

Main or primary sections comprise a main disconnect and up to 18 each of meter bases and distribution disconnects. When additional meters are required, distribution sections—each incorporating up to 24 meters—can be added to form a perfectly matching line-up. The new units are especially well suited to apartment and office buildings, or any multiple-unit structures requiring separate metering.

To illustrate the savings in space which can be affected with this new equipment, a metering switchboard for a 90-unit apartment would require only a main section—18 meters—and three distribution sections of 24 meters each. The entire board could be installed in 66 square feet. Forty-two wall-mounted meters would require the same space.

Design of the metering switchboard provides electrical contractors with significant installation advantages and they requires less buy-out materials.

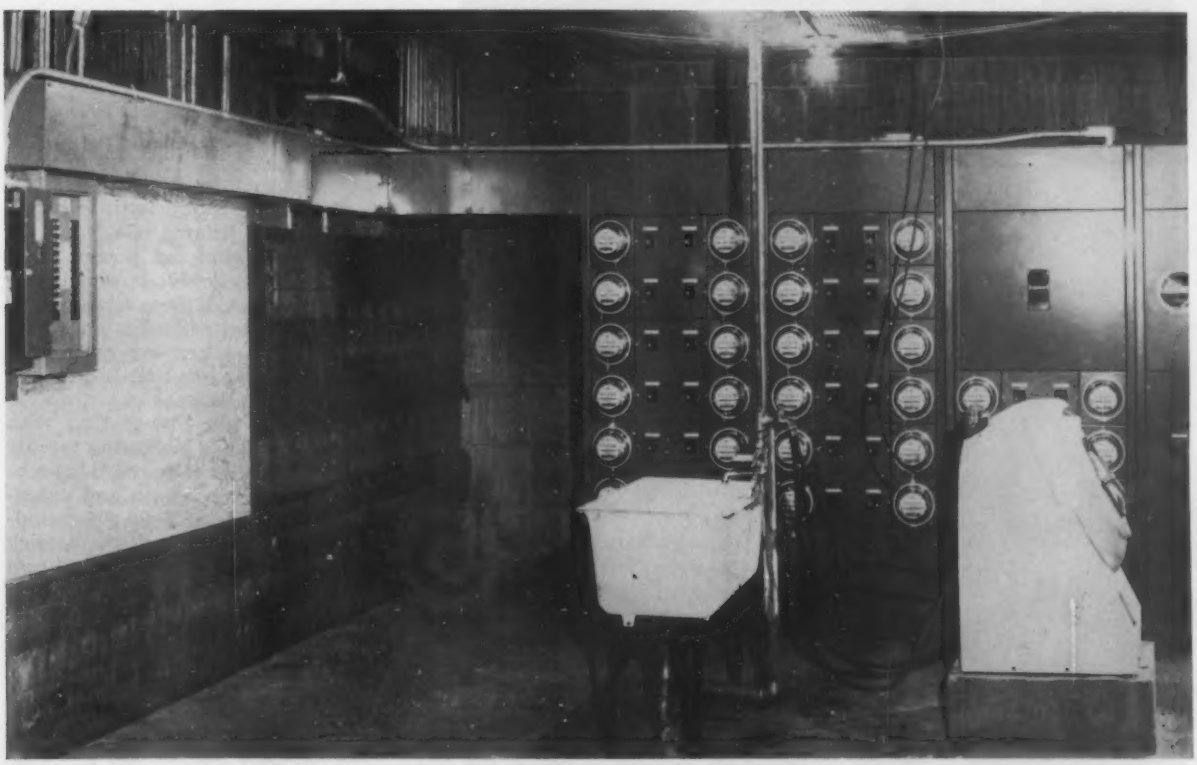
The new board requires no interior wiring, since all bussing from the line side of the main disconnect to the load side of the distribution disconnect is factory-assembled within the unit. Electrical contractors need supply only service entrance cable and distribution wire from the board to each apartment or office.

To facilitate wiring, the new switchboard provides generous wireways and ample entry area for easy, trouble-free installation of service entrance conductors and distribution circuits either at the top or bottom of the unit. All connections and distribution wireways are accessible from the front.

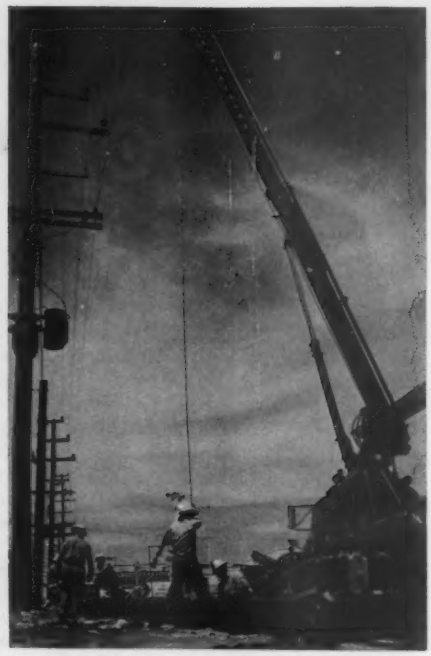
In addition, metered and unmetered conductors are run in separate wireways to conform with utility company requirements.

Standardized construction of the new metering switchboard also assures interchangeability at the job

(Continued on page 118)



One of the first installations of the new Uni-Power metering switchboard is in an Atlanta apartment building. The 66-meter switchboard replaces former wall-mounted units, and comprises an 18-meter section, right, and two 24-meter distribution sections. The load center, left, provides the power for hall and exterior lighting.



Hoist lines are made fast . . .

Big derrick

Georgia Power finds

By Bob Rutherford, Georgia Power Co., Atlanta, Ga.

◆ Installation of power poles along increasingly crowded city streets—most of them already well occupied by distribution, telephone, and other overhead wire circuits—long has been a problem of electric utilities.

The Georgia Power Co., with system demands increasing rapidly each year—has attacked this problem through purchase and extensive operation of a 20,000-pound-capacity truck-mounted derrick equipped with a floating boom and hydraulic outriggers.

The Model 20-TTD-50, built by the Truck Equipment Co., of Denver, Colo., was selected for the task. So successful has been its operation in its first few months of use, according to A. B. Greene, Jr., manager of the utility's construction department, that the company is contemplating a similar vehicle.

. . . the big pole is raised up . . .

. . . the butt end is guided in . . .

. . . and tamping takes place.

facilitates heavy pole installation

unit to be advantageous for placing poles along crowded city streets

In addition, the company is considering a 20-TTD-50 for use by line crews in the Atlanta division —where pole removal and replacement on metropolitan area streets present major problems.

"Especially advantageous," said Mr. Greene, "in view of the increasing use of long poles—some with lengths of 95 feet—has been the rig's floating boom."

Prior to addition of the new piece of equipment, pole setting on city streets was accomplished either by renting a crane or by a crawler type tractor with a fixed boom attached. Where traffic was light and where sidewalk problems were at a minimum, the crawler type tractor was adequate.

In recent years, however, more and more 110-kv and 44-kv transmission lines have been constructed along city streets. With increasing use of 85-, 90-, and 95-foot poles for these lines, the work could not be accomplished without blocking up the truck and guying off the derrick.

"Action of the outriggers," Mr. Green reported, "is what helps give the vehicle its ability to handle long and heavy loads. They consist of two powerful steel arms on each side of the truck. These arms extend hydraulically outward and down from the truck four feet on each side. This gives a 16-foot span for maximum stability.

The outriggers provide both mechanical and hydraulic support, for when the lower outrigger arm nears the ground, the hydraulic cylinder locks the two upper arms in an almost straight line and in overcenter position. This mechanical support is independent of the hydraulic system, and it can be released only by positive pressure from the outrigger cylinder.

Compactness of the turret base also was cited by Mr. Greene as an advantage. Occupying only 16 inches of space behind the cab, this base assembly contains all hydraulic parts, controls, drives, and gear boxes. The hydraulically driven 15,000-pound winch is also contained within this housing.

A special mechanism enables the derrick to be folded up within a 16-inch space over the truck cab or body (and within the truck's length when the derrick is retracted). This enables the vehicle to be transported safely on highways and streets.

The boom is constructed of rectangular-shaped steel box sections which telescope one inside the other. The two-man fiberglass bucket is used extensively by the Georgia Power construction crews to make the necessary overhead connections. With a 55-foot reach, it can be utilized for nearly all such connections.

An operator's seat is at the con-

(Continued on page 118)

System voltage regulation analysis

III—Flexibility is possible in the way system reactive can be distributed between generating stations in order to minimize transmission line loss

By Arnold L. Samuels, Electrical Engineer, Kansas City Power and Light Co., Kansas City, Mo.

(This is the third part of a three-part article discussing the problems involved in operating a system voltage regulation plan.)

◆ Just as alternatives are available in the scheduling of megawatt generation between power plants on the system, flexibility also exists in the way system reactive can be distributed between generating stations.

One criterion for the supply of megavar load is to adjust the megavar output at the generating stations to minimize transmission system line loss. This is particularly applicable to remote generating stations where voltage can be scheduled to minimize line loss without changing voltage schedules in the local system.

The effect of voltage on transmission I^2R is particularly noticeable when a generating station is located at an appreciable distance from the load.

Figure 9 shows a transmission

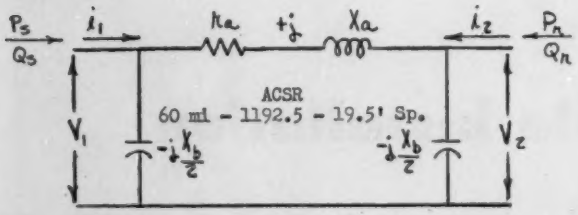


Fig. 9—The transmission line connects to a generating station located an appreciable distance from the load.

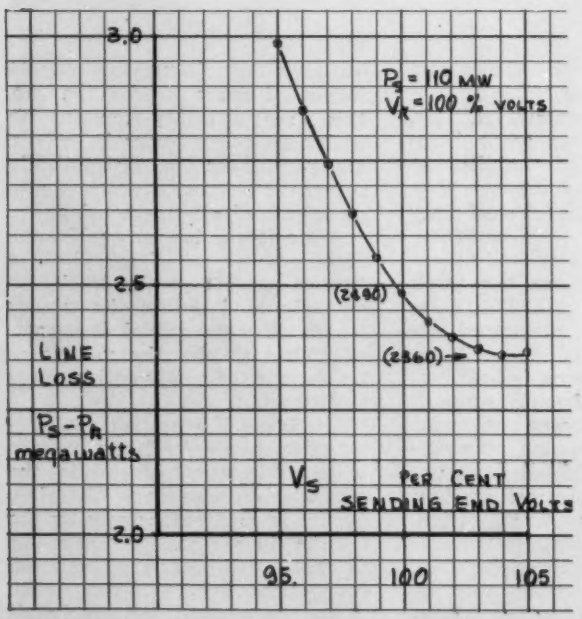


Fig. 10—Shown are the line losses which result from a variation in sending end voltage for a constant input and a constant receiving end voltage of 100 per cent.

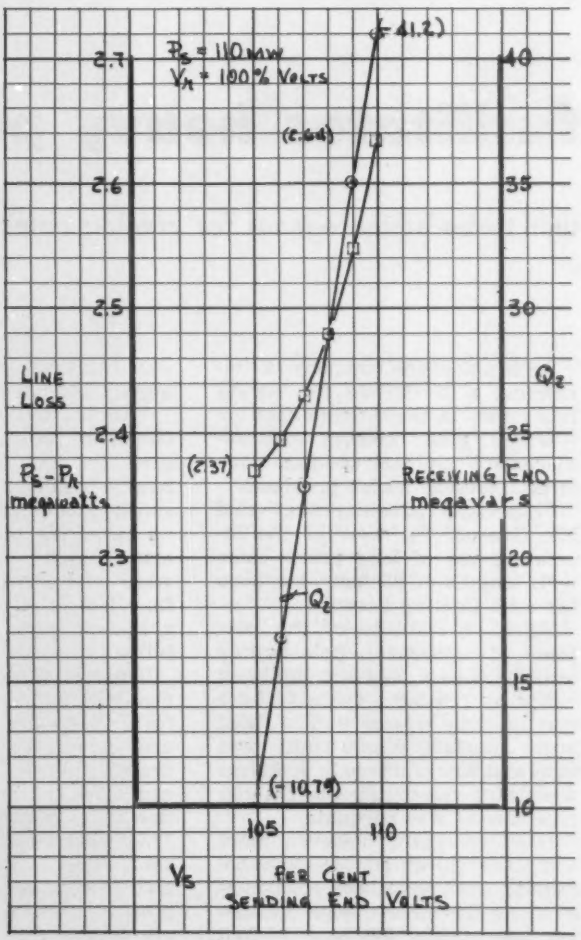
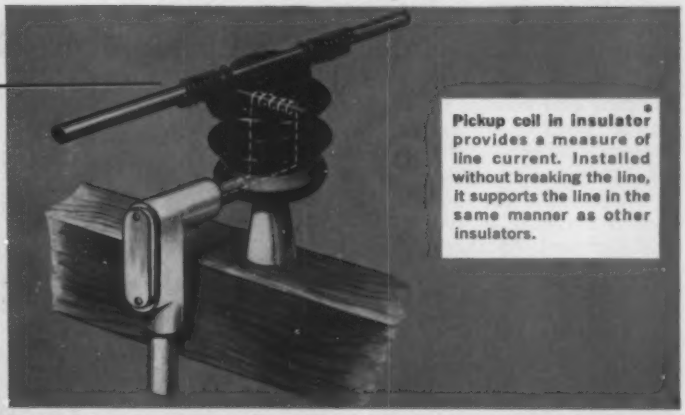


Fig. 11—This shows the change in receiving end megavars and line loss when sending end voltage is varied.

ALLIS-CHALMERS

Extended Foil Capacitors

A-1494



Pickup coil in insulator* provides a measure of line current. Installed without breaking the line, it supports the line in the same manner as other insulators.

Current bias shorting* relay is mounted on the side of the control cabinet in a standard watt-hour meter mount. Its operating point can be easily adjusted from rear of the relay mount.

*Designed by the Fisher-Pierce Company

Slash installation time over 50%

with new voltage-sensitive, current-bias capacitor control

Employing an inductive pickup device rather than a current transformer as the signal source, the new Allis-Chalmers voltage-sensitive current-bias control can be installed *in less than half the time* required for existing controls.

By simply replacing the line insulator with the new pickup insulator, you can eliminate the time and effort of de-energizing, dead-ending and cutting into the line required for a conventional current transformer.

This new A-C capacitor control operates on either light or heavy system loads to switch capacitor banks for voltage correction and reactive kilovar supply.

For more facts on capacitor controls to maintain low-loss, high-power-factor system operation, contact your nearby A-C office. **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin.

Allis-Chalmers extended foil design capacitors withstand higher inrush currents. Current densities are lower at point of contact between the packs and the contact plates than is possible with conventional tab-type capacitor construction.

For more details on above items, use reply card on page 21

line which separates a generating station from the load area. The voltage at the receiving load bus V_2 is constant at 100 per cent. The sending end voltage V_1 is varied until maximum efficiency is obtained for a constant value of input power P_1.

Figure 10 shows the line losses which result from a variation in sending end voltage for a constant input power of 110 megawatts and a constant receiving end voltage of 100 per cent. The line loss is a minimum when the sending end bus voltage is between 104 and 105 per cent. An increase in sending end voltage from 100 to 104 per cent changed the line loss from 2,490 to 2,360 kw or a 130-kw reduction.

If the station producing the 110-mw flow is base loaded 4,000 hours per year

Kwhr saving = 130 kw
× 4,000 hours = 520,000 kwhrs
Annual $ saving = 520,000 kwhrs × $.0025
average cost per kwh = $1,300 per year

The computational method used to determine the variation in transmission line loss for a variation of the sending end voltage is included as Appendix I. (Copies available upon request to Editor.)

Var supply

During system peak loads, an increase in the lagging vars supplied from remote generating stations will reduce the reactive capacity which must be installed on the system to furnish the reactive requirements. Therefore, it is necessary to determine how much reactive can be transmitted to the receiving end on system peak.

At off peak periods when sufficient var generating capability is available at the receiving end of a power system, remote station bus voltage can be operated to achieve maximum power transfer efficiency by a variation of line current p.f. as discussed previously.

From an equipment standpoint, a limitation to var transfer is maximum allowable voltage at the sending end and safe voltage limits must be established before extra var transfer can be attempted. Transformers, for instance, are required to stay within exciting current limits when 105 per cent voltage is applied.

If the remote station bus will need to operate at 110 per cent volts to be able to transmit vars to the load, the transformer manufacturer should be consulted to determine the effect that an oper-

(Continued on page 117)

Reverse polarity relay finds useful application in instrument protection

By Dorsel H. Sparks, Instructor, Mayo State Vocational-Technical School, Paintsville, Ky.

◆ The reverse polarity relay, as its name implies, is a relay designed to perform its function when the electrical polarity of a direct current power source becomes reversed and causes a current flow through the circuit in the wrong direction.

The resulting damage to direct current meters, batteries on charge, and to direct current power sources operating in parallel is well known.

The reverse polarity relay described here can limit such damages, since only a short surge of current can flow because of the almost instantaneous operation of the relay. The reverse polarity relay can be used to operate a circuit breaker which will open the circuit before much damage is done.

This arrangement of a dry-junction type rectifier and a direct current relay in a circuit is not a new idea but information about it is probably not generally known. A great advantage is its economy and simplicity of operation.

Description of relay

The following is a description of the reverse polarity relay and some suggestions about its use:

Select a relay that has the voltage rating required for the circuit in which it is to be used. Connect the relay to the circuit through a milliammeter to measure the relay current requirements at this voltage.

Select a dry half-wave rectifier that has a current rating somewhat higher than the current required for the operation of the relay. This should be 25 per cent greater or even more to insure cool operation of the rectifier.

Attach a terminal of the relay coil to the unmarked end of the rectifier and solder the connection. Connect the marked or plus side of the rectifier to the positive side of the direct current power source and the other relay terminal to the negative side of the power source.

The reverse polarity relay is now connected in such a way that the rectifier portion of it permits only a very small amount of current to flow through the relay. This current is too small to operate the relay due to the comparatively high resistance of the rectifier in this direction.

Now reverse the connections of the direct current power source to the relay-rectifier combination and the relay will operate, closing its normally open contacts. The rectifier has comparatively lower resistance to current flow when the marked end (plus) is connected to the negative side of the power source.

A good dry rectifier will have at least ten times as much resistance when a plus ohmmeter test lead is connected to the plus or marked end of a rectifier and of course the negative test lead to the unmarked end than the same rectifier will have when the negative test lead is attached to the plus or marked end of the rectifier and positive test lead to the unmarked end.

To use this rectifier relay combination as a reverse polarity relay here are some suggestions:

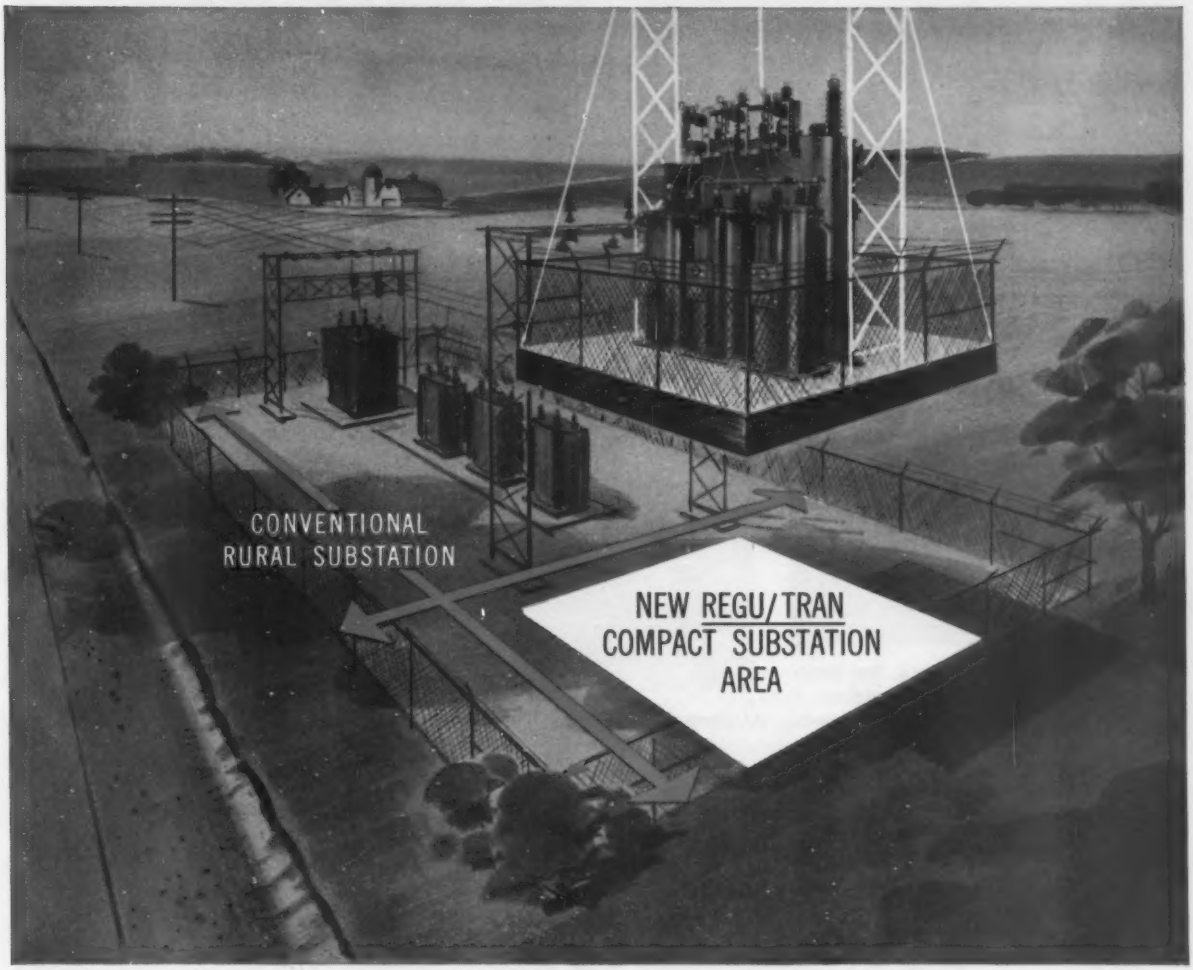
If the relay portion of the rectifier relay combination has normally closed points of sufficient size to interrupt the load current in the circuit, then the combination may be connected in the circuit with the normally closed points connected between the reverse polarity relay and the load.

If the reverse polarity relay points do not have sufficient interrupting current capacity, then use the normally open points on the reverse polarity relay to operate another relay in the circuit that does have sufficient current carrying capacity and connect a set of normally closed points on it between the relays and the load.

For switchboard relaying a reverse polarity relay can be used to operate a relay in the control

(Continued on page 116)

ALLIS-CHALMERS



Space – just one of many savings!

A complete, compact substation package from Allis-Chalmers!

You get guaranteed performance and the economy of a standardized item. *Regu/Tran* compact substation requires only 25% of the area needed by conventional rural substations.

More savings! Buy the entire package on just one purchase order. Shipments are dovetailed to your construction schedule. All parts are keyed to master drawings.

Designed for future load growth! All structural members are punched for adding H.V. and L.V. bays later.

Heart of the substation is the *Regu/Tran* unit. This new concept provides single-phase regulation with provision for safe by-passing of regulating equipment without dropping the load. A-1442

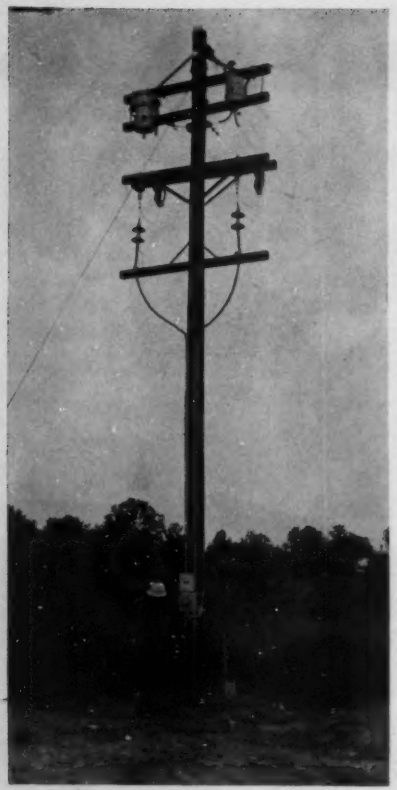
Regu/Tran is an Allis-Chalmers trademark.

Regu/Tran compact substation vs conventional

1. Just 1 mounting pad instead of 3	**2.** 4 piers instead of 6	**3.** 13'9" x 22' compared to 24'x62'
4. Requires just 25% of the real estate formerly needed	**5.** Cuts fencing needs in half	**6.** Requires considerably less grounding material
7. Less interior gravel or rock surfacing	**8.** Preassembled main structures cut erection time	**9.** Regu/Tran unit can be replaced with larger unit later without changing structure

Ask your nearby A-C office for Bulletin 61B9756 or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

For more details on above items, use reply card on page 21



At each apartment group, the overhead power line is dead-ended on a pole with primary metering equipment.

A 15,000-volt buried cable serves the pad-mounted transformers.

Underground distribution gives the apartments an uncluttered appearance.

Underground system feeds project

Apartment project includes 30 units with electric space heating

◆ An underground distribution system feeds power to the 30 all-electric apartments of the Brantley Housing Project in Alabama.

The project consists of two apartment groups — the School Heights Apartments with 20 units and the Grove Apartments with ten units. At each group of apartments, a 7,200-volt single-phase overhead line is dead-ended on a pole in one corner of the property.

This pole also has the necessary equipment for primary metering, which measures the total energy used by all apartments in each group.

From the pole, the power is carried underground to the various pad-mounted transformers required to serve each project. At the School Heights Apartments, one 50-kva and two 75-kva transformers are installed, and one 100-kva transformer is installed at Grove Apartments.

The underground cable serving these transformers is a 15,000-volt concentric cable with a No. 4 AWG inner conductor and with an outer wrap of 12 No. 14 solid coated copper wires serving as the neutral or return. This cable runs from an outdoor termination at the pole into the high voltage compartment of the transformers, and is buried direct at a minimum depth of at least 42 inches.

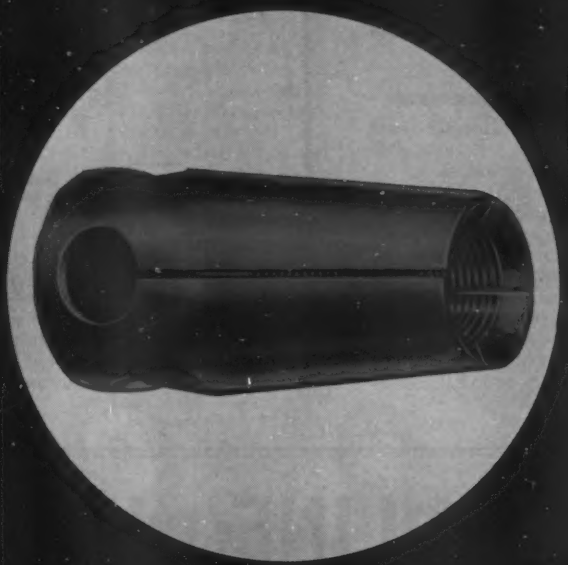
The secondary from the transformers to each apartment building was installed by the contractor, and consists of a two-conductor 600-volt direct burial cable with a bare conductor buried with this cable for the neutral. This secondary cable is buried approximately 30 inches deep.

According to John Hill, commercial manager for Alabama Electric Cooperative, Inc., at Andalusia, Ala., electric bills for the project apartments, which include electric space heatings, averaged $12.41 per family unit for the period from October 1960 through February 1961.

Four apartments have approximately 8.6 kw per unit, 12 have

(Continued on page 116)

You Get This Same "One-Piece" Jaw in ALL FARGO AUTOMATIC SPLICES



FARGO "AUTOMATICS" ARE AVAILABLE IN COPPER OR ALUMINUM FOR COPPER, ALUMINUM, COPPERWELD, ALUMOWELD, "6201" or "5005".

And Here's Why:

1. The quickest method for joining two conductors . . . just insert the wire fully into the inhibitor loaded jaw and the splice is made.
2. The "one-piece" jaw is made from high strength alloys that give a strong, corrosion resistant, "like metal" grip on the conductor . . . permanent but yet readily reclaimed for use again and again.
3. Precision machining of the "one piece" jaw from solid bar stock assures permanent alignment of jaw segments, which prevents individual strands of the conductor from getting out of place.
4. Because of "one piece" construction, jaw segments flair out slightly as the wire is inserted to give an excellent initial grip on the wires.
5. The jaw and conductor move forward as a unit when tension is applied to complete the grip . . . so it can't let go!
6. The "one-piece" jaw permits a liberal safety zone to be machined into the back of the jaw to accommodate burred ends of the conductor.

Ask your Line Material Field Engineer for complete details.

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FARGO MFG. COMPANY, INC.
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New York

FARGO

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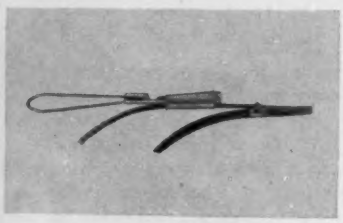
New utility equipment

Blackburn wedge clamps

An all-aluminum wedge clamp for aluminum neutral messengers at service dead-ends has been developed by Jasper Blackburn Corp., 1525 Woodson Rd., St. Louis 14, Mo.

Aluminum-to-aluminum contact between conductor and clamp eliminates bimetallic galvanic corrosion, and adds substantially to the clamp's service life. Construction is heavy-gauge, high-strength aluminum alloy, with flexible nylon-jacketed bail or rigid stainless steel bail.

Design of the clamp eliminates the need to thread cable through the clamp. Because the slider is removable, the clamp can be easily installed anywhere on a continuous run of conductor. Wedging action grips tightly along the entire length of contact. Re-establishment of proper sag, when necessary, is quick and easy.



Only four sizes of the new clamp are needed to dead-end a range of cables from No. 6 solid through No. 4/0 ACSR.

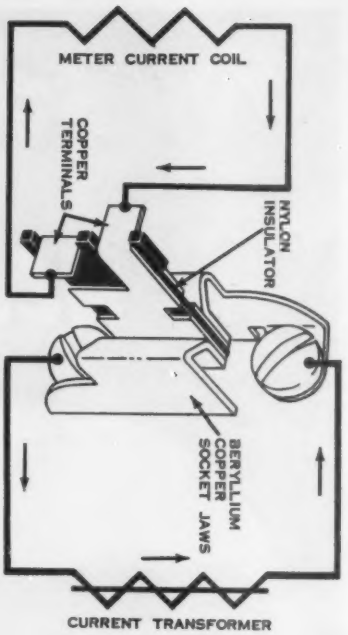
Write U-901 on reply card, p. 21

Sangamo metering equipment

A new type of transformer-rated metering equipment is now available for all conventional services.

The Sangamo Electric Co., 11th and Converse Sts., Springfield, Ill., is manufacturing Autopass metering equipment that provides positive and reliable automatic current by-passing on socket type transformer-rated meter installations.

The Autopass concept guards against loss of revenue, transformer and socket damage, and hazardous high voltages that result from the possible failure of conventional current by-pass devices. The new equipment makes this type of installation economical, safe, and practical without expensive test installations.



Protect the MAIN LINE with

G&W Fused Distribution Centers are an example of the full line of G&W equipment that protects shopping centers all across the country.

The special, short-circuiting terminal jaws of the UM-2 meter mount, in conjunction with the dual current terminals of P20, two stator, and P30, three stator, "C" base meters accomplish the automatic by-pass action and positive circuit opening.

Write U-902 on reply card, p. 21

Anaconda ATRC cable

The Anaconda Wire and Cable Co., 25 Broadway, New York, N. Y., has introduced a new ATRC cable especially designed for use in telemetering, automatic relays, communications circuits, and supervisory control systems.

The new cable has a rating of 300 volts. It is particularly adaptable for aerial, duct, and direct burial use in telemetering, automatic relays, telephonic communication circuits, supervisory control for monitoring, and data recording.

Write U-903 on reply card, p. 21

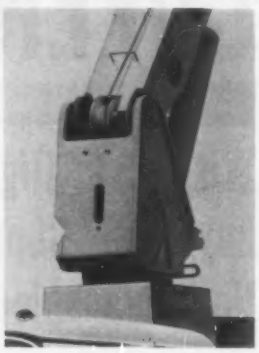
Pitman hydraulic turret

A new concept in rotation mechanisms for Polecat derricks and diggers has been announced by Pitman Manufacturing Co., Garner Avenue and Duck Rd., Grandview, Mo.

Called the Uni/Dyne turret, this rotation device is featured on all models of the Pitman Polecat; it contains a rotation gear system and hydraulic motor entirely within the turret housing.

The new rotation system is unique in that the hydraulic motor, operating through a planetary gear system and spur gear train, turns a worm (supported in the turret housing) around the main worm gear, rotating the turret 375 degrees in either direction. All gears run in a bath of oil.

The worm and worm gear lock instantly in case of power loss, preventing any loss of boom control. This self-locking feature provides a rigid base for digging, lifting heavy loads precisely, and raising men aloft in a fiberglass bucket and boom extension (optional equipment on the Pitman Polecat).



Uni/Dyne turret's single-piece housing is of cast steel, stress-relieved; yet the turret is so compact that it can be installed in only 14 inches of mounting space, and has a maximum over-all height of 32 inches. No external chains, sprockets, exposed gears, or cables are necessary for turret rotation.

Write U-904 on reply card, p. 21

Pow-r Mole pipe pusher

The new heavy-duty Pow-r Mole made by Pow-r Devices, Inc., Clarence Center Rd., Clarence Center, N. Y., was designed and developed to push rod in any condition where pushing is possible and pull ½ to 3½ inch diameter copper, steel, plastic pipe, or tubing underground faster, easier, and more accurately.

The unit is designed for exceptional accuracy when set up properly. It attaches to most standard tractor-mounted hydraulic back hoes. One man can dig the trenches, attach and set up the unit, insert the rod sections, and operate the tractor hydraulics. The unit comes complete with a full set of cribbing, 50-foot push rod, and pusher cap. By utilizing the furnished cribbing, the machine

G&W Fused Distribution Centers

✻ **Ever had trouble with a branch 4-kv primary tap that blew the whole main feed?**

✻ **Did you ever want to work on a tap and find you had to shut down the whole system before the tap could be isolated and safe to handle?**

G&W Fused Primary Distribution Centers solve these problems completely by providing a fused, three-phase or single-phase disconnecting device that can be operated under load for any tap off the main primary supply. Ideal for protecting primary loops or radial systems operating at voltages up to 15 kv, the G&W Centers can be used indoors or outdoors; are easy to install; and provide a disconnect for safety.

G&W Fused Distribution Centers have proved themselves time and again in applications at shopping plazas, industrial plants, and institutions with one or more buildings but these are only a few of the many places where they can be effective.

Distribution Centers are flexible. One or more circuits can be brought into a center to supply a fused load, or a single supply circuit can be used to feed a fused bus from which multiple load circuits are taken. The main primary feed can terminate in the box or run through as required. Insulated bus pads are provided for each phase leg with no limitation on the number of taps. The box can be bolted onto a concrete pad or embedded four to six inches into the concrete when the pad is poured.

Distribution Centers are gasketed to provide a weatherproof unit that fully meets NEMA Type 3 standards for weatherproof construction. Watertight, submersible construction is also available.

G&W ELECTRIC SPECIALTY COMPANY
3524 WEST 127TH STREET • BLUE ISLAND, ILLINOIS
Canadian Mfr. • Powerlite Devices, Ltd. • Toronto, Montreal & Vancouver

superior quality standards — inspired specialized design

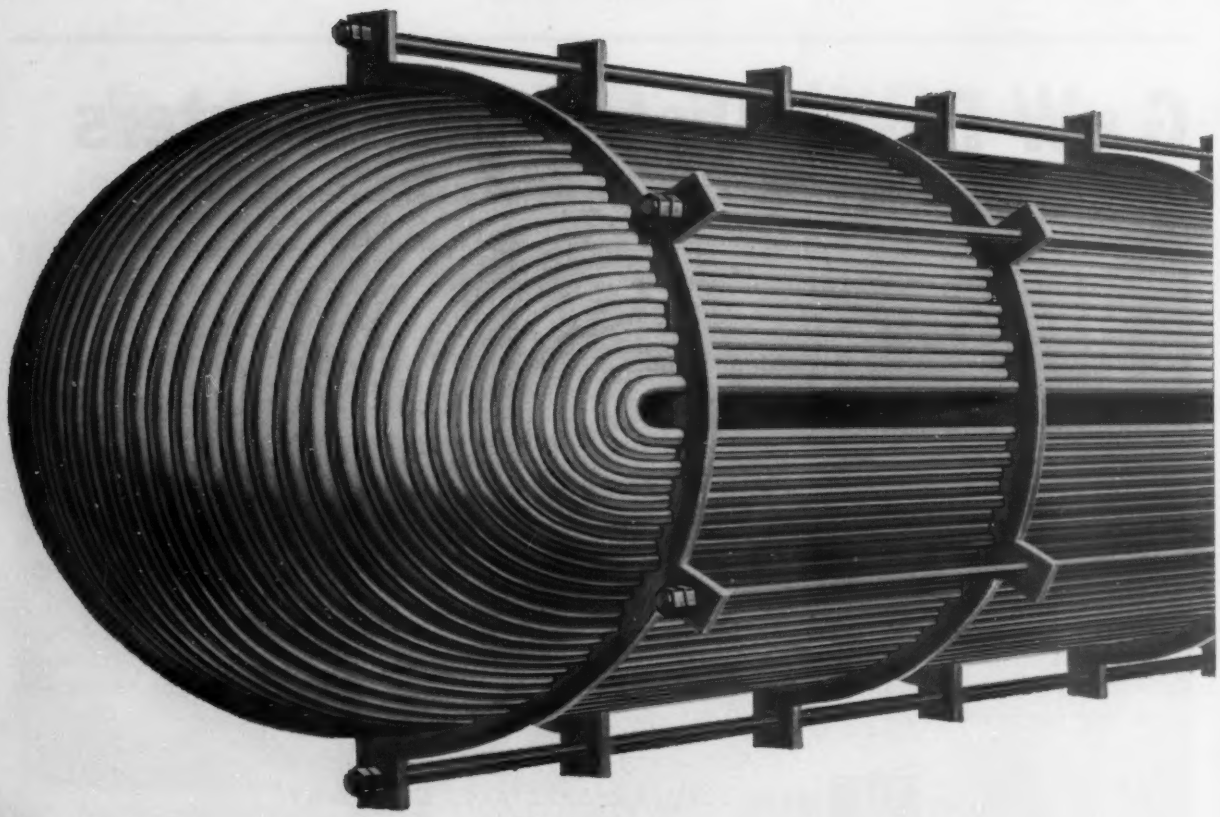
C61-2

Another New Extra High Strength
Condenser Tube Developed by

PHELPS DODGE!

CUFENLOY-40

With 15% Higher Strength than
any other Copper-Nickel Alloy
Now Available!



In August 1959, Phelps Dodge introduced the first high strength copper-nickel alloy condenser tube, Cufenloy-30. Now Phelps Dodge offers Cufenloy-40, a copper-nickel alloy with greatly increased strength suitable for the most severe applications in high pressure feedwater heaters. The mechanical and physical properties of this exclusive new alloy make possible substantial reductions in the cost of feedwater heaters. Cufenloy-40 has received approval for ASME Code applications through Case 1300 (Special Ruling).

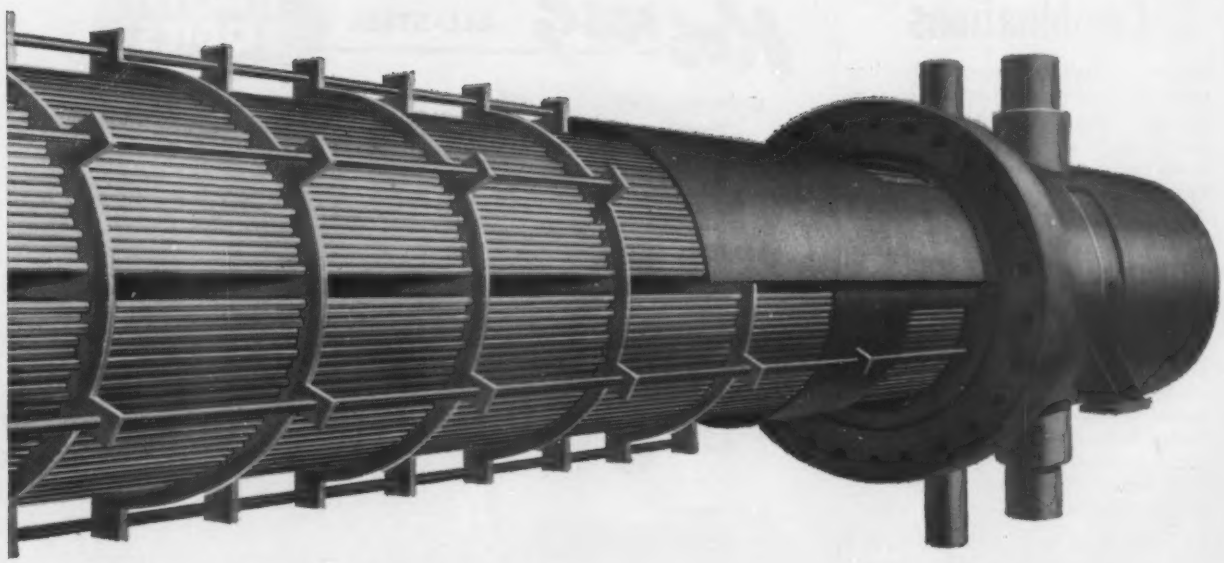
Weldability. Extensive tests in Phelps Dodge's laboratories were performed to determine Cufenloy-40's welding characteristics. Standard welding procedures used for 70/30 copper nickel tubes were found to be fully acceptable for this new composition. Pull-out, Cycling and Pressure Tests confirmed that a maximum joint efficiency was obtained using these procedures.

Corrosion Resistance. Corrosion studies have been performed on Cufenloy-40 since 1959 and have shown it to be unsusceptible to stress corrosion cracking in a moist ammonia and carbon dioxide atmosphere. In these tests Cufenloy-40 also proved virtually immune to general chemical attack. It is believed that Cufenloy-40 has the best overall corrosion resistance of the copper-nickel alloys.

Dual Gauge. Cufenloy-40 condenser tubes are available in dual gauges wherever a thickened wall section is needed to compensate for thinning on tight radius bends.

U-Bent Tubes. Cufenloy-40 tubes are also furnished in factory "U" bends for immediate tubing into the unit at the manufacturer's plant or on the job site.

Further Information from your local Phelps Dodge sales office, or write Dept. 2-E for the Cufenloy-40 technical brochure.



PHELPS DODGE COPPER PRODUCTS
CORPORATION
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MINE TO MARKET P D

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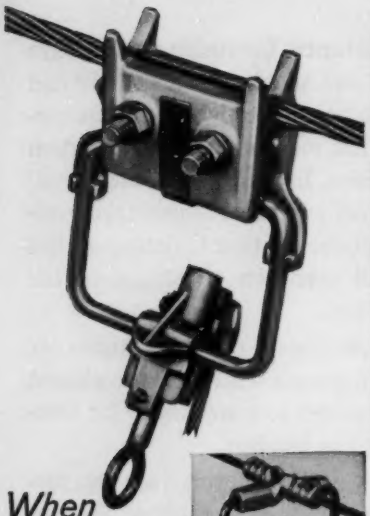

When Hot Line Taps are Subject to Change

Protect Conductor with Chance Tap and Bail Clamp Combinations

Where jumpers or apparatus hot line taps are temporary or subject to change, these Tap and Bail Clamp Combinations are being widely used to avoid main line "punishment." Chance Snap-on Bolted Bail Clamps or Right Angle Compression Bails permanently installed on the main conductor permit one or two clamp connections to be made on the bail wire. Any arcing that occurs when the tap is connected or disconnected is confined to the bail.

Snap-on spring action and contact guides facilitate installation of the Bolted Clamp. The right angle of the Chance Compression Bail aids installation with compression tools and gives easy accessibility from the pole for tap installation.

To make extra certain that you get a good connection, the contact grooves on all Chance Bail Clamps are filled with z.l.n. 100 Electrical Contact Aid. Bails are available in either aluminum or cadmium-plated copper.

CC61-24A

A. B. CHANCE CO.

CENTRALIA, MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

remains fixed in position throughout operation.

With the heavy-duty Pow-r Mole, direction can be reversed by changing the position of the two drag springs with no need to turn the pusher around.

This saves on material costs because the same set of push rod will last indefinitely. The unit has a five-inch stroke and operates at a force of up to 35 tons.

The heavy duty Pow-r Mole has few moving parts and the jaws are made of tool steel, so maintenance is at a minimum.

Write U-905 on reply card, p. 21

Reynolds overhead cables

Overhead transmission cables in the larger 6/1 sizes are being produced up to 50 per cent longer than previously possible by Reynolds Metals Co., Box 2346, Richmond 18, Va.

Reynolds recently shipped reels of aluminum cable, steel reinforced (ACSR) to Utah Power and Light Co., Salt Lake City, in AWG sized 3/0 and 1/0 with lengths of 12,000 and 14,000 feet. Weighing 2,770 and 2,033 pounds, respectively, the reels allowed the utility company to string longer lines with fewer reel changes necessary.

Write U-906 on reply card, p. 21

Chance conductor cutters

Two new power tools for cutting electrical conductors have been developed by the A. B. Chance Co., 210 N. Allen St., Centralia, Mo.

One tool is used for quickly cutting single core ACSR on line construction and maintenance work,

Koenig ALL-STEEL **UTILITY BODIES**

LINE-CONSTRUCTION BODY

. . . available in 9' to 14'6" lengths with mechanical or hydraulic winch and derrick, or any other special or custom equipment desired. Compartments can be arranged to your specifications.

SERVICE BODIES

. . . for ½-, ¾-, and 1-ton chassis. Electrically welded into one unit with six waterproof compartments, recessed paddle handles keyed alike and fender skirt protected with die-formed rolled edges. Built for safe, dependable service . . . will outlast several chassis.

SIDE BOXES

For all pick-up trucks, including the new compacts. Watertight compartments . . . double panel doors . . . recessed paddle handles with cylinder locks keyed alike. Eleven types, seven lengths available.

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JOSLYN
welded screw
ANCHORS

STRONGEST—Helix is welded to the high-strength rod by carefully-controlled new technique; weld is tough, ductile, and stronger than the base metal.

EASIEST TO INSTALL—Minimum torque is required for hand or power installation because of:

1. Scientifically correct angle of the helix which causes minimum earth disturbance.
2. Sharp, knife-like cutting edges of the helix which bite into the soil.
3. Chisel point, which bores a lead hole and works its way around rocks and other obstructions.

LONGEST LIFE—Entire anchor (rod and welded helix) is hot dip galvanized after fabrication to insure maximum resistance to corrosion.

MOST READILY AVAILABLE—Stocks in sizes from 4" to 15" in diameter are maintained in Joslyn Warehouses.

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JOSLYN MFG. AND SUPPLY CO.

155 N. WACKER DRIVE • CHICAGO 6, ILLINOIS

while the other is used to cut through heavy copper stranded conductor.

Both tools are available with mechanical fittings for operating off a hydraulic power source or they can be purchased to be operated from either an air compressor or bottle of dry nitrogen.

The power tools are particularly advantageous to use from insulated bucket mechanisms as they can be operated from the power source on the lifting mechanism.

Conductor cutters are available with insulated handles so that they safely can be used on or near energized lines.

Write U-907 on reply card, p. 21

G-E gas-filled transformer

General Electric Co., 1 River Rd., Schenectady 5, N. Y., is now marketing a gas-filled, sealed dry type transformer in ratings 300 kva and above, 15 kv and below.

Utilizing $C_3 F_8$ (perfluoropropane) gas as an insulating/cooling medium, the new units offer higher impulse levels, lighter weight, and smaller dimensions.

The gas is non-flammable, non-explosive, and non-toxic, and will not decompose even under extreme-

ly abnormal operating temperatures. No rotating equipment or other moving parts will be utilized to cool the unit.

Superior insulating properties of the fluorocarbon type gas make comparable the full wave impulse levels of the new gas-filled unit with those presently listed by industry standards for liquid-filled distribution type units.

The basic impulse level of the 15-kv gas-filled unit is 95 kv, compared with the standard impulse level of 50 kv for a comparable 15-kv nitrogen-filled unit.

Write U-908 on reply card, p. 21

Westinghouse var control

An improved var control (CJ-7) for switching capacitors is available from Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

Two styles are available: one for wye systems and one for delta. Principal difference is that the wye control has zero torque when voltage

and current are in phase; the delta trol has zero torque when voltage leads current by 30 degrees.

Both controls are adjustable from 250 vars leading to 500 vars lagging. The two contact settings (close and trip) are independently adjustable through the entire range providing the band spread between them is greater than the change produced by switching the capacitors.

Two thermal plug-in type fixed time-delay relays, one in the close circuit and one in the trip circuit, provide a predetermined time delay that eliminates unwanted switching operations from rapid system fluctuations of short duration. The fixed time-delay relays are in the circuit only during automatic operation.

Also, to prevent unwanted switching operations after a complete loss of voltage, a toggle type control relay is used. With this relay, the oil switches remain fixed in position when voltage is lost.

Write U-909 on reply card, p. 21

Hubbard bracket

Hubbard and Co., 200 S. Michigan Ave., Chicago 4, Ill., has developed a point type transposition bracket which is lighter in weight but stronger than earlier designs.

Increased strength with less weight is the result of welded construction employing the proper amount of metal in the places where it is most needed.

The bracket is furnished for spindle threaded insulators and is mounted with 5/8-inch carriage bolts. The cross-over clearance is one inch. Three sizes are available.

Write U-910 on reply card, p. 21

Plastic cable connectors

Newly designed plastic cable-connecting sleeves and terminals for making through connections and branches of electric cables have been placed on the American market by N. V. Hollandsche Draad- en Kabelfabriek of Amsterdam, a leading wire and cable factory in The Netherlands.

These sleeves and terminals feature sheathings of plastic, natural, or synthetic rubber (neoprene), or lead.

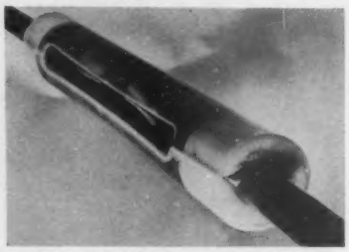
The sleeve consists of a hard polyvinyl chloride tube, one side of which is straight-cut over its entire length and has a pouring groove in the direction of the saw cut. The two ends of the tube are sealed by glued-in foam plastic (polyurethane) plugs with a hole in the center for passing the cable through.

The sleeve is bent open and positioned around the connection. Then, the space between the connection and the sleeve is filled with a twin-component resin sealing compound.

The company also produces the sealing components, which come in two tins.

The quantities of resin and curing agent are inter-related so that weighing is not necessary.

Both the cable-connecting sleeves



and the terminals can be supplied in various sizes for different cross sections. Purchaser specifications are followed.

Write U-911 on reply card, p. 21

Penn-Union disconnects

A new compression quick disconnect for hot line tool work, as well as for heavy-duty manual disconnects, has been introduced by Penn-Union Electric Corp., 315 State St., Erie, Pa.

The device has no loose parts that can fall during installation. The U-bolt is rigidly attached and has peened ends retaining the nuts.

This tee disconnect, type KHTF, is self-keying — the disconnect lug spots in position when its recess meets a boss on the tee's tongue. Having indents on both sides, the disconnect lug can be engaged either

(Continued on page 92)

fold down

...and
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"Tiny Tim"™–
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50-KVAR
power
capacitor

50-KVAR "Tiny Tim" case dimensions: 15" high x 4½" wide x 13½" deep. Weight: 62 lbs. 100-KVAR "Tiny Tim" case dimensions: 28¼" high x 4½" wide x 13½" deep. Weight: 115 lbs. Ratings: 2400 through 7960 volts, 60 cycle, single phase, with single or double bushings.

(actual size!)

It's not just the smallest (no bigger than conventional 25-KVAR's) but also the lightest: 62 pounds. We also have a 100-KVAR that meets NEMA standard mounting dimensions for 50's. Savings to you are obvious: in sub-stations, on poles—in utility and distribution systems. Along with these savings, you still get the famous Cornell-Dubilier 99.6% trouble-free operating rate. Our Bulletin 8150 explains all. Ask your FPE sales engineer for a copy, or write: Power Factor Capacitor Marketing Dept., Federal Pacific Electric Co., 333 Hamilton Blvd., South Plainfield, N. J.

BLACKBURN PAC CLAMPS

In salt-laden coastal atmospheres, in fume-choked industrial areas . . . millions of Blackburn PAC clamps stay on the job year after year. No breakdown. No deterioration of electrical efficiency.

We've treated them even worse in our laboratory. Over 10 years of torturing salt spray and heat cycle tests, and they still perform like troupers. The PAC Series is the most corrosion resistant, electrically efficient BIMETALLIC connector in the world! The reason? Some exceptionally fine engineering and construction that eliminates soldered liners.

We'd like to show you how these extraordinary clamps are made and how they reacted to our severe testing. Write for Data Folder #6007.

Jasper
BLACKBURN
Corporation

1525 Woodson Road • Saint Louis 14, Missouri

For more details on above items, use reply card on page 21

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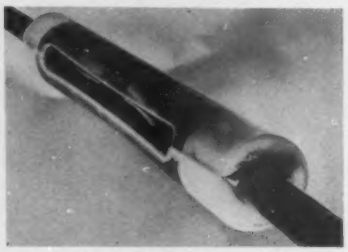

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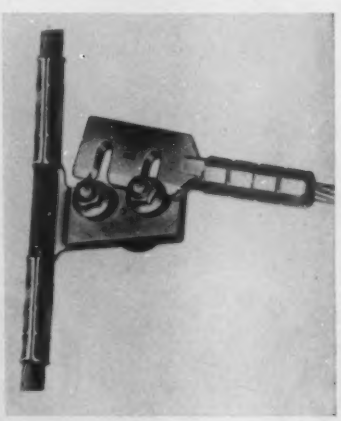
(Continued on page 92)



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"Tiny Tim"™–
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50-KVAR
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50-KVAR "Tiny Tim" case dimensions: 15" high x 4½" wide x 13½" deep. Weight: 62 lbs. 100-KVAR "Tiny Tim" case dimensions: 28¼" high x 4½" wide x 13½" deep. Weight: 115 lbs. Ratings: 2400 through 7960 volts, 60 cycle, single phase, with single or double bushings.

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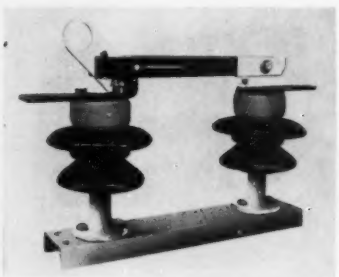
Federal Pacific air switches

Solid silver contacts are built in to insure longer life and added reliability in a new line of hook-operated air switches introduced by Federal Pacific Electric Co., 50 Paris St., Newark, N. J.

Available in ratings of 7.5 kv through 34.5 kv, 400, 600, and 1,200 amperes, the AgH air switches are the first of a line which incorporated several new design features.

The new AgH switches have momentary ratings of 20,000 and 40,000 amperes and are manufactured in accordance with latest NEMA, ASA, and AIEE standards. Two types are available: single-pole — single-throw and single-pole—tandem-transfer.

Widely spaced parallel blades of hard-drawn, high-conductivity copper have unitized construction to pro-



vide a rigid blade unit that will not deflect under the most severe operating conditions. Time-proven silicon bronze spring washers on the hinge end maintain uniform contact pressure throughout the life of the switch.

The unique one-piece mechanical latch and hookeye has a ¾-inch pry-off action. The latch and all other top hardware are of stainless steel. Switch contact pressure is provided by a floating cantilever spring of stainless steel. Flat characteristics of the spring's design prevent any effect on contact pressure by wear. The switch is furnished with a hot-dipped galvanized four-inch channel base.

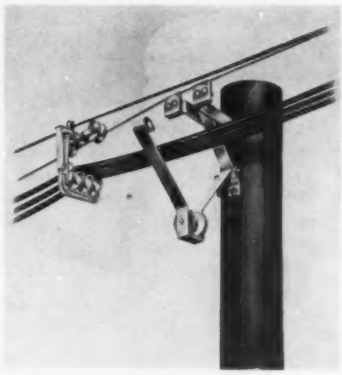
Write U-948 on reply card, p. 21

Messenger traveling block

A messenger traveling block and new type messenger bracket introduced by Sherman and Reilly, Inc., 1st and Broad Sts., Chattanooga, Tenn., tremendously speed installation of spacer type aerial cable.

All blocks are put on at the lead pole and ride past intermediate poles without assistance or interruption of the pulling operation.

The block, model MT-404, is all aluminum construction with ball bearing rollers. The bracket is steel galvanized and remains as a permanent part of the installation. Both pole mounting and crossarm mounting messenger brackets are available. The V-shaped slack carrier supports



the pulling line. After the stringing operation is completed, the slack carriers are removed for use on subsequent jobs.

This new method of installing aerial cable is known as the continuous stringing system.

Write U-949 on reply card, p. 21

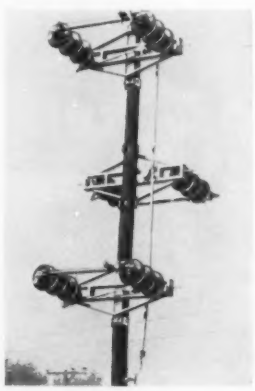
I-T-E wood-pole switch

A new wood-pole mounted switch from I-T-E Circuit Breaker Co., 1900 Hamilton St., Philadelphia 30, Pa., features higher voltage application of side-break switches, in vertical configuration.

The new design of all-aluminum welded switch mounting frames will now support switches up to 115 and 138 kv, for one-way switching on one wood pole. Other voltage ratings for two-way or three-way switching are limited to 69 kv.

The new switch, known as Savar, is used generally for interrupting line-charging or transformer magnetizing current, and for switching moderate loop currents, depending on the loop circuit impedance.

Manual, reciprocating type operating mechanisms are used, but motor



operators can be applied for automatic operation. The specially designed switch base assembly can be fastened direct to a wood pole with through bolts, requiring no other bracing or parts.

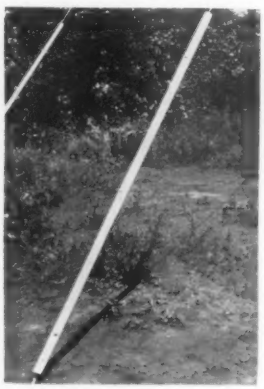
With wood poles predrilled, each switch pole can be mounted in position completely assembled. Pretesting has indicated that assembly time and operating effort are lower than that usually required for 115-kv and 138-kv switches.

Write U-950 on reply card, p. 21

Fanner guards for guy wires

A line of plastic safety guards for guy wires has been announced by the Electrical Products Div., Fanner Manufacturing Co., Brookside Park, Cleveland 9, Ohio.

The new guards are hazard-proof, enduring, and economical. The line provides such practical advantages of a specially formulated vinyl type plastic material as safety, smoothness, flexibility, resiliency, shock resistance, corrosion resistance, and fire



resistance. The guards are also nonconductive and have no sharp, jagged edges.

The new devices can be used with any standard dead-ending clamp.

Write U-951 on reply card, p. 21

Indoor-outdoor transformer

Redesign of its 600-volt indoor-outdoor, window type transformer type TWM for greater user convenience has been announced by Allis-Chalmers Manufacturing Co., 938 S. 70th St., Milwaukee 1, Wis.

This current transformer is now available in dual ratios of 200/400:5, 300/600:5, and 400/800:5 amperes. Single ratio transformers have new color coded rating plates to simplify and speed identification on stockroom shelf or pole.

A new clip-on arrangement for applying company number tags eliminates the need for removing rating plates for tag attachment.

The lightweight transformer is easily adapted for conduit type hookup and can be used on two- or three-wire, single- and polyphase circuits. The 2¾-inch window openings of the 400-, 600-, and 800-ampere transformer can accommodate two 750 MCM or three 500 MCM insulated cables.

Write U-952 on reply card, p. 21

BLACKBURN PAC CLAMPS

In salt-laden coastal atmospheres, in fume-choked industrial areas . . . millions of Blackburn PAC clamps stay on the job year after year. No breakdown. No deterioration of electrical efficiency.

We've treated them even worse in our laboratory. Over 10 years of torturing salt spray and heat cycle tests, and they still perform like troupers. The PAC Series is the most corrosion resistant, electrically efficient BIMETALLIC connector in the world! The reason? Some exceptionally fine engineering and construction that eliminates soldered liners.

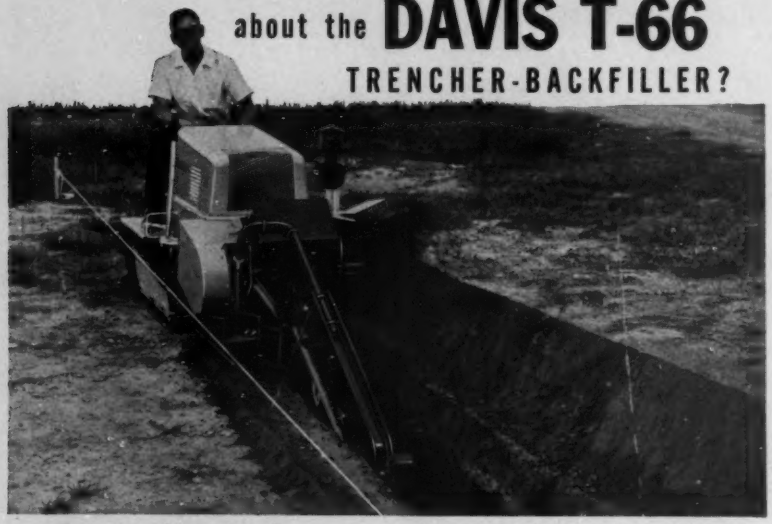
We'd like to show you how these extraordinary clamps are made and how they reacted to our severe testing. Write for Data Folder #6007.

Jasper
BLACKBURN
Corporation

1525 Woodson Road • Saint Louis 14, Missouri

For more details on above items, use reply card on page 21

Why are owners so enthusiastic about the DAVIS T-66 TRENCHER-BACKFILLER?



Because it outperforms any other trencher in its class and does its own *BACKFILLING* to boot!

Enthusiasm is the result of profits... and that's what the T-66 produces. It not only digs with amazing efficiency in the toughest soil conditions... but finishes up where others leave off—by backfilling. Ground-gripping traction for accurate ditching control and backfilling power is attained by large track shoes, a unique hydraulic drive, and the T-66's extra-heavy 1400-lb. weight. No erratic rubber-tire bounce. Hydraulically controlled boom lets you govern digging depth and handle the backfill blade with ease. Digs 4" wide, **66" deep** or **12" wide**, 30" deep and at varying widths and depths in between.

Special Attachments for 16" Trenches and Flush Digging

These special attachments open the door for jobs previously reserved for larger, more expensive machines. Handles 16" trenches down to 24" deep with ease... or flush digs alongside walls or fences.

the DAVIS HUSTLER UTILITY TRAILER

This 2000-lb. capacity, tilt-bed trailer for the T-66 and other loads has low center-of-gravity stability and load equalization suspension system. Sides optional.

the DAVIS PUP TRENCHER *Self-Propelled*

Digs by itself. This self-propelled trencher is driven by a six-speed winch mechanism. A productive tool for trenches 2"-3" wide to 36" deep, or 4" wide, 18" deep.

A REAL BACKFILLER

Heavy-duty, 42" blade attaches to boom in less than 5 minutes. Blade can be set straight or angled left... raised and lowered hydraulically. Nimble maneuverability — no sluggish gear shifting — because of Instant Forward/Reverse. The T-66 as a backfiller is not an afterthought... it's designed that way.

We Welcome Competitive Demonstrations!

Owner's enthusiasm creates confidence that invites comparison. See why the T-66 is the new standard of values for trenchers. It's built by men who are leaders in the design of ditching equipment. **Ask about the T-66's 90-day unconditional guarantee.**

DAVIS MFG. INC.

1524 S. McLean Blvd., Wichita 13, Kan.

Please send me descriptive T-66 literature and the name of my DAVIS dealer____. I am also interested in the Davis Pup____ Davis Hustler____.

NAME_____

ADDRESS_____

TOWN_____ STATE_____

D1-261

right or left. In addition, large massive aluminum tongues assure excellent contact.

A straight disconnect of similar design, Penn-Union type KHLU, also has only two parts and is self-keying when engaged from either side.

The compression indents are made with standard tools.

Write U-912 on reply card, p. 21

Thompson meter-base mount

A new meter-base mount which will accommodate both die-cast and sheet metal meter bases is now available from Thompson Products Co., 4630 Beverly Dr., Dallas 5, Texas.

The new model M-4 mount, which permits easy attachment of a meter

base to a brick veneer wall, assures that the meter will not become loose.

The device is designed to mount small meter bases, as well as those 200-ampere, three-phase sizes and larger. Either a vertical or horizontal position can be used.

Write U-913 on reply card, p. 21

Knopp loading transformer

A new five-kva loading transformer which may be used continuously for testing and calibrating meters, sectionalizers, cables, oil circuit breakers, busses, etc., where currents up to 1,000 amperes are required, is now offered by Knopp, Inc., 1307 66th St., Oakland 8, Calif.

Model CL-6, which can be used continuously at a five-kva rating when used with rated voltage on 110- and 220-volt connections, weighs 60 pounds and is 12 inches in length, nine inches wide, and ten inches high.

Frequency of the transformer is 50/60 cycles, with input taps for 90, 110, 180, and 220 volts. The output is five volts, 1,000 amperes in parallel connection, or ten volts, 500 amperes in series connection.

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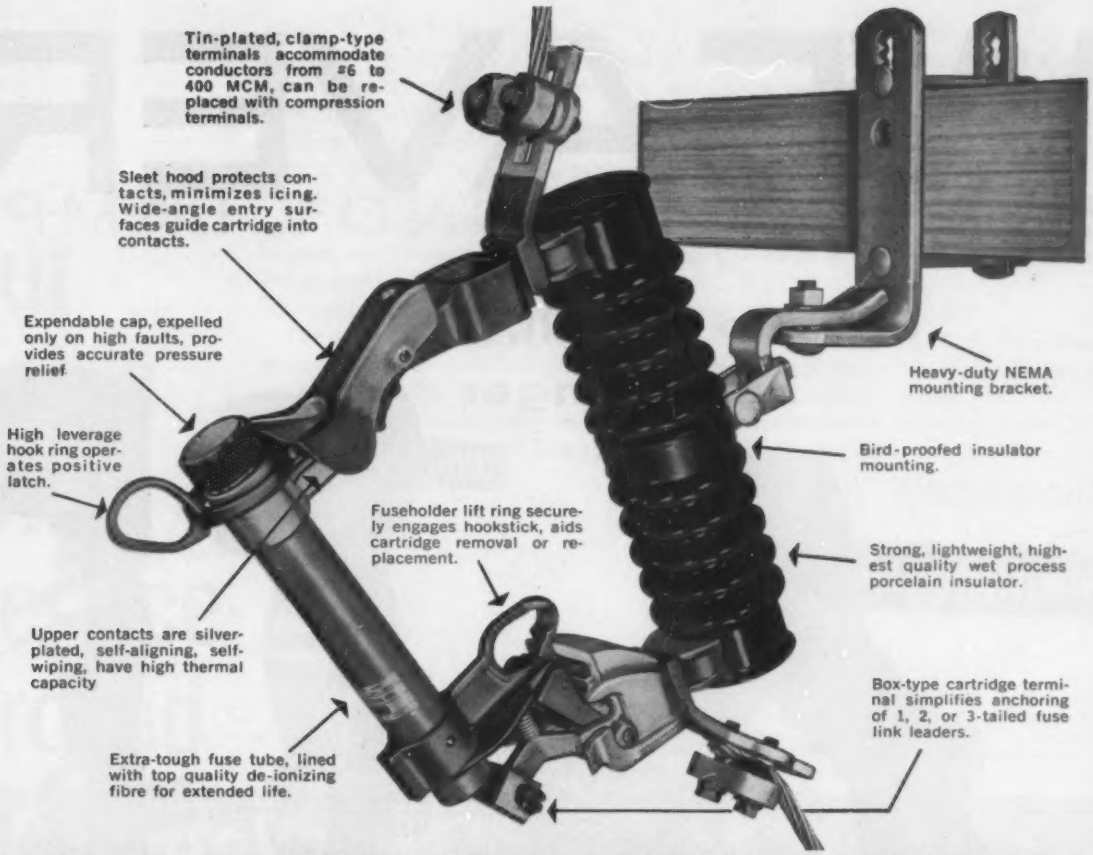
Tin-plated, clamp-type terminals accommodate conductors from #6 to 400 MCM, can be replaced with compression terminals.
Sleet hood protects contacts, minimizes icing. Wide-angle entry surfaces guide cartridge into contacts.
Expendable cap, expelled only on high faults, provides accurate pressure relief.
High leverage hook ring operates positive latch.
Upper contacts are silver-plated, self-aligning, self-wiping, have high thermal capacity
Extra-tough fuse tube, lined with top quality de-ionizing fibre for extended life.
Fuseholder lift ring securely engages hookstick, aids cartridge removal or replacement.
Heavy-duty NEMA mounting bracket.
Bird-proofed insulator mounting.
Strong, lightweight, highest quality wet process porcelain insulator.
Box-type cartridge terminal simplifies anchoring of 1, 2, or 3-tailed fuse link leaders.

NEW KEARNEY 200 AMP "HX" CUTOUT

Kearney substation-proved to positively and repeatedly interrupt 12,000 amperes at 7.8 KV . . . 10,000 amperes at 15 KV

- No "blind" spots . . . a highly efficient combination of single end venting and expendable cap double venting insures dependable interruption throughout the entire fault range . . from low current values to maximum rated capacity of the cutout.
- On low and medium faults, expendable cap remains intact . . . tube vents only at bottom. Controlled spring loading and long travel of lower hinge toggle whips fuse cable out of cartridge to insure positive low current interruption.
- Expendable cap is expelled only on high faults. Resultant double end expulsion in line with fuse tube relieves gas pressure, equalizes interruption shock forces and prevents damage to cutout or bracket.
- Switchstick-operated positive latch prevents accidental cartridge dropout due to vibration, impact, or magnetic forces.
- Strong, durable, non-ferrous construction for long life, optimum performance. All current-carrying parts copper alloy. Silver-plated contacts. Stainless steel pins and springs.
- Fuseholders accept all conventional button-type links.
- Kearney "HX" Fuse Cutouts are available on single insulator, NEMA station-post, or centerbolt insulator mountings; also in 100 ampere continuous ratings.

Ask your Kearney Sales Representative for full information or write for "HX" Cutout Bulletin

for better construction . . . safer maintenance . . . specify KEARNEY products

KEARNEY

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

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WEAVER
BRONZE GROUND CLAMPS

. . . Easy to Install,
Last Longer

Compare WEAVER Bronze Ground Clamps with any others. WEAVER Clamps are bigger, heavier and more rugged. Extra metal at pressure points gives maximum strength . . . increases conductivity. The all-bronze construction with heavily cadmium-plated screws prevents rust and corrosion . . . assures safe, permanent grounding. Swinging top eliminates loose parts to assemble and cuts down installation time. Only 3 types cover every grounding job. Sizes for ¼" through 4" copper or galvanized pipe.

Ask your Electrical Wholesaler For
Weaver Bronze Ground Clamps

J. A. WEAVER Company

2110 Howard Street • St. Louis 6, Mo. • GArfield 1-6336

cut costs with service-proved GC breakers

When the new Westinghouse GC Single Tank Three Phase Power Circuit Breakers (rated 14.4 kv; 100, 250 and 500 mva) were first introduced, tests indicated that they would provide greater protection and require less maintenance and installation cost than the superceded type G breakers. Actual service records now verify these predictions.

Three key features make this performance possible.

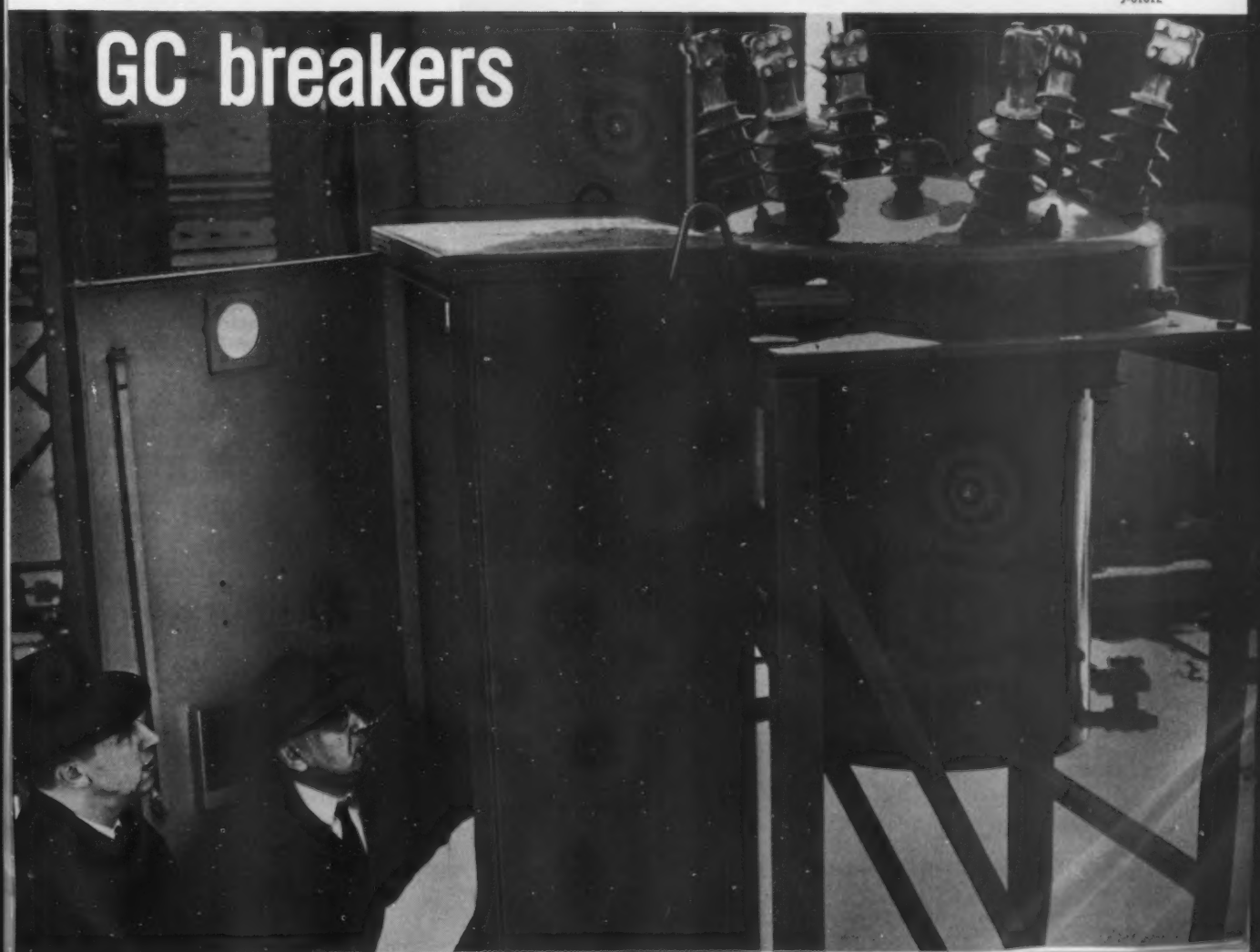
First, these GC breakers interrupt essentially within three cycles, from 0 to 100% of rating. This provides greater protection against line and equipment damage due to faults—reduces possibility of line burndown. It also reduces arcing time within the breaker which results in less contact burning and oil contamination and, therefore, less maintenance.

Second, simple solenoid operating mechanism minimizes maintenance.

Third, closing current requirements have been slashed to less than one-half compared to units available as recently as three years ago. Result here is lower installation costs since much smaller control cables and transformers or batteries can be used.

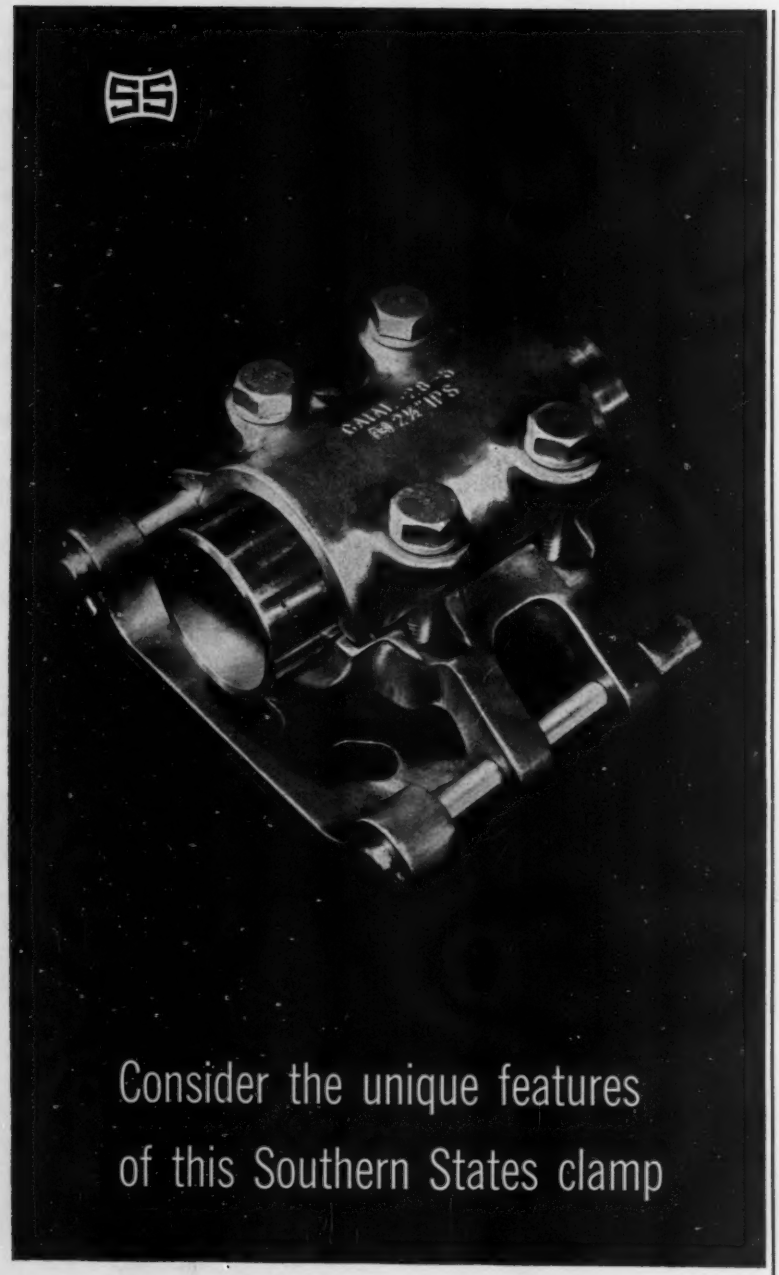
For complete facts, call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's*

Westinghouse



J. M. Kadetsky (right) of Pennsylvania Electric Company and T. C. Pitzer, Westinghouse Sales Engineer, discuss a 14.4 kv, 100 mva, GC Breaker. A good performance record has been logged by this unit installed in Pennsylvania Electric's Boulevard Substation, Johnstown, Pa.

J-61012



This exclusive design offers many advantages in a sliding bus support clamp: two stainless steel excursion rods... wide support to provide high cantilever strength... movement in only one direction — no pivoting or side chatter... heat-treated, high strength aluminum... anodized bolts. The Type CAIAL is another example of Southern States engineering.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

Output currents indicated are maximum for continuous duty, and on intermittent duty the output currents may be increased to 750 amperes at ten volts and 1,500 amperes at five volts on a 40 per cent duty cycle of 20 minutes on and 30 minutes off.

The transformer's insulating terminal panel is rigidly secured to the unit's frame, and heavy-current, bus bar type terminals are securely bolted to the panel.

Write U-914 on reply card, p. 21

Helpful literature

A 52-page pocket manual of general information, operating and maintenance tips, and connections for pole type **distribution transformers** is now available from **Allis-Chalmers Manufacturing Co.**, 938 S. 70th St., Milwaukee 1, Wis. The 3-5/8- by 6-7/8-inch booklet, "Transformer Tips," 61X9659, also carries tables and charts covering pole type transformers 167 kva and smaller, 15,000 volts and below. Its contents are particularly directed to distribution system operating personnel and should be helpful as a training aid.

Write B-915 on reply card, p. 21

Bulletin GEA-7153, 12 pages, from **General Electric Co.**, 1 River Rd., Schenectady 5, N. Y. describes the features, operation, application, and maintenance of the new Permalex large distribution **transformers** (single and three-phase, 167/187-500/560 kva, 15 kv and below) for commercial and industrial distribution. The publication includes photos, graphs, dimensional drawings, and rating, weight, and dimension tables.

Write B-916 on reply card, p. 21

A new six-page illustrated folder containing recently updated information on Transite **electrical duct** is now available from **Johns-Manville Corp.**, 22 E. 40th St., New York 16, N. Y. TR-271A contains data on all fittings and dimensions of Transite electrical duct, and is aimed at providing designers of duct systems with the complete J-M product line related to their needs. Designed in the form of a "spread sheet," information is readily found on joining, making terminal connections, direction changes, and other configurations. In addition, the folder also describes J-M's plastic couplings.

Write B-917 on reply card, p. 21

A bulletin describing the new line of plastic **safety guards for guy wires** is available from the Electrical Products Div., **Fanner Manufacturing Co.**, Brookside Park, Cleveland 9, Ohio. The bulletin contains drawings illustrating typical methods of attachment and also lists dimensions.

Write B-918 on reply card, p. 21

For more details on above items, use reply card on page 21

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New series of tables extended to include larger hourly rates

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

CONDUIT STRAPS - MASONRY MOUNTED (DRILLING BY HAND)

SIZE	HOURS EACH	LABOR COST EACH AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
1/2"	.22	.44	.495	.55	.61	.66	.72	.77	.83	.88	.94	.99
3/4"	.22	.44	.495	.55	.61	.66	.72	.77	.83	.88	.94	.99
1 "	.27	.54	.61	.68	.74	.81	.88	.95	1.01	1.08	1.15	1.22
1 1/4"	.32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
1 1/2"	.36	.72	.81	.90	.99	1.08	1.17	1.26	1.35	1.44	1.53	1.62
2 "	.36	.72	.81	.90	.99	1.08	1.17	1.26	1.35	1.44	1.53	1.62
2 1/2"	.36	.72	.81	.90	.99	1.08	1.17	1.26	1.35	1.44	1.53	1.62
3 "	.38	.76	.86	.95	1.05	1.14	1.24	1.33	1.43	1.52	1.62	1.71
3 1/2"	.43	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61	1.72	1.83	1.94
4 "	.43	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61	1.72	1.83	1.94
5 "	.54	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03	2.16	2.30	2.43
		"TWO HOLE"										
1 1/2"	.43	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61	1.72	1.83	1.94
2 "	.43	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61	1.72	1.83	1.94
2 1/2"	.49	.98	1.10	1.23	1.35	1.47	1.59	1.72	1.84	1.96	2.08	2.21
3 "	.49	.98	1.10	1.23	1.35	1.47	1.59	1.72	1.84	1.96	2.08	2.21
3 1/2"	.49	.98	1.10	1.23	1.35	1.47	1.59	1.72	1.84	1.96	2.08	2.21
4 "	.54	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03	2.16	2.30	2.43
5 "	.54	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03	2.16	2.30	2.43
6 "	.65	1.30	1.46	1.63	1.79	1.95	2.11	2.28	2.44	2.60	2.76	2.93

E-102-B

LABOR: Includes drilling anchor and securing strap.

9-61

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CONDUIT STRAPS "ONE HOLE" - MASONRY MOUNTED
(DRILLING BY POWER)

SIZE	HOURS EACH	LABOR COST EACH AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
1/2"	.16	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68	.72
3/4"	.16	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68	.72
1 "	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
1 1/4"	.23	.46	.52	.58	.63	.69	.75	.81	.86	.92	.98	1.04
1 1/2"	.26	.52	.59	.65	.72	.78	.85	.91	.98	1.04	1.11	1.17
2 "	.26	.52	.59	.65	.72	.78	.85	.91	.98	1.04	1.11	1.17
2 1/2"	.26	.52	.59	.65	.72	.78	.85	.91	.98	1.04	1.11	1.17
3 "	.26	.52	.59	.65	.72	.78	.85	.91	.98	1.04	1.11	1.17
3 1/2"	.32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
4 "	.32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
5 "	.37	.74	.83	.93	1.02	1.11	1.20	1.30	1.39	1.48	1.57	1.67
		"TWO HOLE"										
1 1/2"	.32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
2 "	.32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
2 1/2"	.32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
3 "	.37	.74	.83	.93	1.02	1.11	1.20	1.30	1.39	1.48	1.57	1.67
3 1/2"	.37	.74	.83	.93	1.02	1.11	1.20	1.30	1.39	1.48	1.57	1.67
4 "	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
5 "	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
6 "	.47	.94	1.06	1.18	1.29	1.41	1.53	1.65	1.76	1.88	2.00	2.12

E-102-B

LABOR: Includes drilling anchor and securing strap.

9-61

CONDUIT STRAPS "ONE HOLE" - STEEL MOUNTED
DRILLING BY POWER

SIZE	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
1/2"	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
3/4"	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
1 "	.26	.52	.59	.65	.72	.78	.85	.91	.98	1.04	1.11	1.17
1 1/4"	.32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
1 1/2"	.32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
2 "	.37	.74	.83	.93	1.02	1.11	1.20	1.30	1.39	1.48	1.57	1.67
2 1/2"	.37	.74	.83	.93	1.02	1.11	1.20	1.30	1.39	1.48	1.57	1.67
3 "	.37	.74	.83	.93	1.02	1.11	1.20	1.30	1.39	1.48	1.57	1.67
3 1/2"	.47	.94	1.06	1.18	1.29	1.41	1.53	1.65	1.76	1.88	2.00	2.12
4 "	.47	.94	1.06	1.18	1.29	1.41	1.53	1.65	1.76	1.88	2.00	2.12
5" "	.53	1.06	1.19	1.33	1.46	1.59	1.72	1.85	1.99	2.12	2.25	2.39
		"TWO HOLE"										
1 1/2"	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
2 "	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
2 1/2"	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
3 "	.47	.94	1.06	1.18	1.29	1.41	1.53	1.65	1.76	1.88	2.00	2.12
3 1/2"	.47	.94	1.06	1.18	1.29	1.41	1.53	1.65	1.76	1.88	2.00	2.12
4 "	.53	1.06	1.19	1.33	1.46	1.59	1.72	1.85	1.99	2.12	2.25	2.39
5 "	.53	1.06	1.19	1.33	1.46	1.59	1.72	1.85	1.99	2.12	2.25	2.39
6 "	.63	1.26	1.42	1.58	1.73	1.89	2.05	2.21	2.36	2.52	2.68	2.84

E-102-B

LABOR: Drilling by power, and installation with bolts. If threaded holes are required to be tapped, add 30% to above figures.

9-61

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News of the industry

edited for Southern readers

Hotel remodeling project uses electroluminescence

ONE OF THE FIRST large scale uses of electroluminescence for decorative illumination was made recently in the Rice Hotel, Houston, Texas.

The installation is part of a $5-million redecorating program undertaken by the 48-year old hotel.

Electroluminescent units, called Rayescent panels by Westinghouse, were installed to form a unique ceiling of electroluminescent light in the new lobby of the hotel. According to Philip F. Dietz, Westinghouse manager of Rayescent products, the installation in the completely rejuvenated Rice Hotel covers 521 square feet and consists of 128 Rayescent panels.

The Rayescent ceiling forms an ellipse 31 feet long. It was designed by the interior and industrial design firm of Richard Kent, Inc., of New York, which designed the lobby, exterior entrances, and other areas of the Rice Hotel.

The firm is headed by Dick Kent, whose design and decoration experience has been prominent throughout the hotel field through his work in such outstanding hotels as the St. Anthony in San Antonio and the International Hotel at Idlewild, New York.

Kliegl Brothers Lighting, of New York, manufacturers of specialty lighting and originators of the Klieglight, engineered and manufactured the special 20- by 27-foot oval-shaped fixture which uses the Rayescent panels. In addition, Kliegl Brothers supplied a unique dimming circuit which automatically raises the Rayescent panels to full brightness as daylight approaches and lowers the light output during the nighttime hours.

Since the Rayescent panels, which have been specially designed for the installation by Westinghouse engineers, operate at 600 volts (60 cycles), the company provided a power kit to operate the unusual ceiling.

The electroluminescent light in the Rice Hotel lobby covers 521 square feet and contains 128 individual units, colored blue to simulate the Texas sky.

Executives demonstrate Holan bare hand method

TWO HOLAN EXECUTIVES are touring Southern states this fall to help utilities launch live line bare hand methods for working on live high-voltage lines.

Daryl E. Gaiennie, Holan executive who leads the live line bare hand team, and C. Merle Call, sales manager of Holan Corporation of Georgia, will present detailed information on the new method and offer to utility operating and executive committees this four-point program for the establishment of bare hand maintenance.

(1) Coordinate the efforts of utilities and national safety groups in setting new work procedures and safety regulations.

(2) Solicit utility equipment requirements for bare hand work and incorporate them in future Holan designs.

(3) Obtain utility personnel training requirements prior to establishing a Holan training program for the bare hand concept; and

(4) Help establish testing standards for bare hand equipment and make available Holan services and facilities for determining standards.

Merle Call D. Gaiennie

Working on energized high-voltage lines of 34.5 kv to 138 kv, the team has performed such work as installation of compression repair sleeves, bundled conductor spacers, temporary jumpers, insulators, shunt splices, and armor rods. More than 46 man-hours were saved at one work site in performing tasks necessary to energize a 138-kv major substation.

Holan pioneered the equipment used in the tests of the new technique—the Holan elbow (insulated aerial lift) and metal mesh shielding—and has been granted exclusive rights to manufacture, sell, and license the shielding.

Tampa Electric creates outdoor lighting service

A NEW SERVICE in outdoor area lighting has been introduced to electric consumers in the area served by the Tampa Electric Co., Tampa, Fla.

The service is designed specially for homeowners and business operators in unincorporated areas where they have been unable to obtain area lights on a group contract or street light tax district basis.

Under the plan, the company will install and maintain automatic electronic-eye type lamps, which will remain the property of the utility firm. The lights will be available in any quantity desired and will be installed on wooden poles with overhead wiring. No additional deposit will be required from present TECO customers.

Customers will be billed monthly for the service charge on their regular electric bills.

Installations will be made only when, in the judgment of Tampa Electric, the location of the proposed light is, and will continue to be, easily and economically accessible to company installation and maintenance.

Manufacturer becomes Southern States, Inc.

SOUTHERN STATES, INC., is the new name for Southern States Equipment Corporation of Hampton, Ga.

For 44 years the company has been known as "Southern States" throughout the industries it serves. The change in corporate signature is intended to acknowledge this with a more descriptive and concise company name.

Chance opens center for engineering tests

THE A. B. CHANCE Company's new engineering research center, constructed during the past winter, is now in full operation.

The research center contains 32,000 square feet of office and laboratory space in two buildings on an 18-acre tract located near the company's general offices in Centralia, Mo.

C. H. LeVee, vice-president, engineering, is in charge of the new facility and has extended an invitation to utility personnel to visit the new center and observe the operation and testing equipment.

The exterior appearance of the main building is dominated by the high-bay construction of the center's high-voltage laboratory. This lab has a ceiling height of 62 feet, necessary to accommodate the towering 2,400,000-volt impulse generator. Sixty-cycle dielectric test transformers, with a 1,000,000-volt capacity, are also located in this laboratory.

A short circuit laboratory with specially designed equipment is used to test protective devices, switchgear, and other apparatus. A 762,000-kva generator is the key piece of equipment in this lab, that also includes a test substation with two single-

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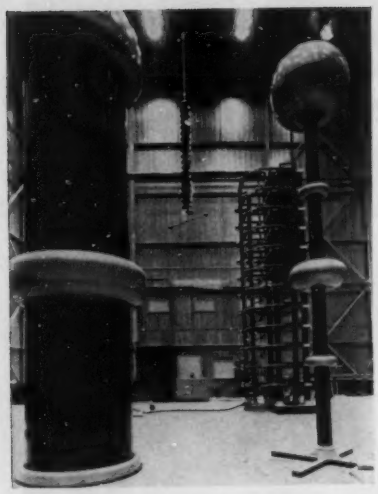
Suchman Associates, Inc., Miami
NuRo Company, Houston—Dallas—San Antonio



The 60-cycle test transformer is seen in left foreground, the 2,400,000-volt impulse generator is in right background at new engineering research center of A. B. Chance Co.

phase, 200,000-kva short circuit transformers. The substation and testing circuits were designed by Chance engineering personnel.

Other facilities in the center include mechanical, plastics, heat run, environmental, fuse link, and electrical measurement laboratories. The latter area includes calibration equipment to insure the accuracy of all testing instruments. Outdoor mechanical and electrical test areas are located adjacent to the engineering research buildings.

The center will be made available to utilities, engineering colleges, and other manufacturers serving the electrical industry.

Sales kits promote commercial lighting

BECAUSE COMMERCIAL SALES engineers of the Georgia Power Company are "all-purpose" salesmen, and have to be prepared for all types of electrical problems, the commercial lighting division has recently issued them lighting kits containing all the tools required for making a lighting survey and, if necessary, an on-the-job layout, reports Jason Elrod, supervisor of commercial lighting sales.

The main items contained in the kit are a light meter, portable drafting board, 50-foot tape, and a picture album of some of their best jobs.

The kit also contains technical information such as recommended levels, current practices, etc. After several months trial in one division, the results were so encouraging that the kits have now been issued to all the commercial sales engineers in seven divisions of the utility company.

Sundial names agents for Southern states

THE APPOINTMENT of two Southern representatives was announced recently by Ben Ronn, general manager of Sundial Electric Corp.

Milton L. Fewell has been named agent for the Florida area, and Ed C. Vaughn has been appointed to handle North and South Carolina sales of heating equipment.

G-E lamp advertising uses new techniques

GENERAL ELECTRIC swings into its four-week light bulb promotion starting October 2 with a "Kick-Off for Profit" program highlighted by spot television starring UPA's Mister Magoo and new merchandising and display techniques, according to Robert V. Corning, manager of marketing for General Electric's Large Lamp Dept.

"Great improvements in both our merchandising programs and in our spot TV programming highlight the news in our POPS—Point of Purchase Selling system—with prime emphasis on improved aid for the dealer," Mr. Corning stated.

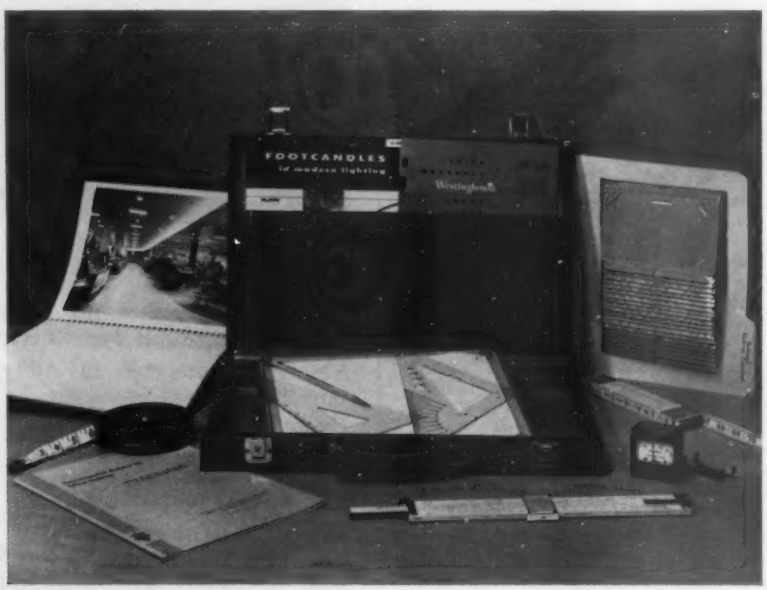
Major effort cited by Mr. Corning in the fall push is improved merchandising and display programs tailored to the individual channel—drug, hardware, food, variety, etc.—and emphasis in a four-week spot TV campaign on daytime programming because "this period has proved to be the top salesgetter in our very successful past Mister Magoo experience."

For the fall campaign, soft-white bulbs will be given feature treatment, Mr. Corning said. Four three-way bulbs also are being featured in the soft-white finish. Increased emphasis on four-bulb package display of 40-, 60-, 75-, and 100-watt types was also indicated. Mr. Corning cited completion of a recent study in which test displays of only four-bulb packs of the fast-moving types outsold two-bulb package displays by 19 per cent.

New supplemental tie-in bulb display merchandisers and other display items are being tailored to the individual market. They'll tie in with the company's national ad theme for maximum impact at the point-of-sale during the coming promotion. A repeat of the large, tissue bulb for use above display racks will be made.

Also in the fall bulb program is a schedule for space ads calling for

Fall promotion from General Electric will include pylon bulb displays featuring Mister Magoo cartoons.



This kit enables Georgia Power commercial sales engineers to make a lighting survey, and if necessary, layouts of recommended installations.

printing on pink paper. Full page ads, featuring Mister Magoo, are being run in *McCall's* and the *Saturday Evening Post*, printed on pink paper.

Florida supply firm merges for expansion

IN A MOVE designed to further its expansion from Key West to Miami and across Florida, Consolidated-Southern Electric Supply, Inc., recently gained ownership of the Friendly City fixture house in Bradenton and established one of the most comprehensive electrical supply houses in that section of Florida.

"Consolidated is still on the move," said Fred Braverman, president, who, envisions a complete merger with national coverage and is at the point of obtaining Securities Exchange approval for an over-the-counter stock issue.

This mushrooming organization began when Mr. Braverman arrived in Florida with meager capital and major ambitions. The Consolidated mergers now account for sales of $25,000,000 annually since inception of the units back in 1955, when Mr. Braverman admitted his total capital was the $38 he had in his wallet on his arrival in the state.

The mammoth fixture display in Bradenton has many imported lighting units.

A year ago, Consolidated merged its Miami facilities with Southern Electric Supplies, its largest Miami competitor. This is a wholly-owned subsidiary of Consolidated Southern of Miami.

Principals in the Bradenton facility are Jack Edwards, vice-president;

NEW Prismatic wrap around

23 FEATURES cut installation cost

1. Die formed. 2. Not less than 20 gauge, prime, cold rolled steel. 3. ELECTROSTATICALLY painted. 4. HPF ballasts, U.L. listed, E.T.L. and C.B.M. approved. 5. Two and four lamp models. 6. Rows, flush or pendant installation. 7 Extremely shallow, 8 indented end-plates for light-seal. 9 Lamp and reflector location provide high efficiency illumination the E. T. L. reports; 10 low brightness, 11 even light distribution, 12 no shadows, 13 no visible lamplines. 14 Slide-out lamp holders and 15 fused circuit. 16 Ventilated snap-in cover provides; 17 longer ballast life, 18 eliminates vibration hum, 19 removes without tools for faster installation, 20 diffuser, extruded polystyrene with optical properties the E. T. L. reports, 21 one-piece wrap-around 22 locks in to prevent accidental fall-out 23 deluxe appearance at low cost.

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Excerpt from Electrical Contractor's unsolicited report . . . Letter of 4/10/61

. . . Our workmen advise that never have they installed any fixtures with so many features to aid them in installation; and we, needless to say, are happy to hear of advantages like this that can affect our cost.

Sincerely,
Clarence Grimm Electric Co., Inc.
H. W. Jasper, Estimating Eng.

STA-BRITE Fluorescent Mfg. Co.

3550 N. W. 49th STREET • MIAMI, FLORIDA

For more details on above items, use reply card on page 21

Dates ahead

Southeastern Electric Exchange, Power Coordination Committee, Henry Grady Hotel, Atlanta, Ga., Sept. 12, 1961.

Public Utilities Association of the Virginias, White Sulphur Springs, W. Va., Sept. 14-16, 1961.

American Institute of Electrical Engineers, Petroleum Industry Conference, Jung Hotel, New Orleans, La., Sept. 17-20, 1961.

AIEE - ISA - IRE, Industrial Electronics Conference, Bradford Hotel, Boston, Mass., Sept. 20-21, 1961.

Edison Electric Institute, Eighth Annual National Electric Farm Power Conference, Leamington Hotel, Minneapolis, Minn., Sept. 20-22, 1961.

Illuminating Engineering Society, National Technical Conference, Chase Park Plaza Hotel, St. Louis, Mo., Sept. 24-29, 1961.

National Rural Electric Cooperative Association, Region III, Admiral Semmes Hotel, Mobile, Ala., Sept. 25-26, 1961.

Missouri Valley Electric Association, Sales, Rural, and Home Service Conference, President Hotel, Kansas City, Mo., Sept. 27-29, 1961.

Old Dominion Industrial Exposition, Inc., Statewide Industrial Exposition, "Index," Roanoke, Va., Sept. 27-30, 1961.

National Rural Electric Cooperative Association, Region I, John Marshall Hotel, Richmond, Va., Sept. 28-29, 1961.

Southeastern Electric Exchange, Accounting Section Conference, Atlanta Biltmore Hotel, Atlanta, Ga., Sept. 28-29, 1961.

International Association of Electrical Leagues, 26th Annual Conference, President Hotel, Atlantic City, N. J., Oct. 4-6, 1961.

American Institute of Electrical Engineers, Middle Atlantic (Fall) Textile Conference, Barringer Hotel, Charlotte, N. C., Oct. 5-6, 1961.

National Electrical Contractors Assn., Annual Convention and Exposition, Sheraton Park Hotel, Washington, D. C., Oct. 9-12, 1961.

National Rural Electric Cooperative Association, Region X, Cortez Hotel, El Paso, Texas, Oct. 12-13, 1961.

American Institute of Electrical Engineers, Fall General Meeting, Statler-Hilton Hotel, Detroit, Mich., Oct. 15-20, 1961.

International Association of Electrical Inspectors, Southern Section, Grove Park Inn, Asheville, N. C., Oct. 16-18, 1961.

Southeastern Electric Exchange, Engineering and Operation Section Conference, Buena Vista Hotel, Biloxi, Miss., Oct. 26-27, 1961.

National Rural Electric Cooperative Association, Region II, Golden Gate Hotel, Miami Beach, Fla., Oct. 30-31, 1961.

Fourteenth Annual Power Distribution Conference, University of Texas, Austin, Texas, Oct. 30-Nov. 1, 1961.

National Rural Electric Cooperative Association, Region VIII, Jung Hotel, New Orleans, La., Nov. 2-3, 1961.

Southeastern Electric Exchange, Sales, Advertising, and Public Relations Conference, Tides Hotel, St. Petersburg, Fla., Nov. 15-16, 1961.

American Institute of Electrical Engineers, Winter General Meeting, Hotel Statler, New York, N. Y., Jan. 28-Feb. 2, 1962.

Missouri Valley Electric Association, Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 15-16, 1962.

Sixth National Electrical Industries Show, New York Coliseum, March 11-14, 1962.

National Electric Comfort Heating Exposition and Symposium, Sherman Hotel, Chicago, Ill., March 19-21, 1962.

Southeastern Electric Exchange, 29th Annual Conference, Boca Raton Hotel and Club, Boca Raton, Fla., Mar. 26-28, 1962.

American Institute of Electrical Engineers, South Central District Meeting, Hotel Peabody, Memphis, Tenn., April 4-6, 1962.

Eugene Stark, secretary; Jack Saltzman, treasurer; L. A. McInnes, manager; and Z. G. Hawk, sales representative. Leonard Leetzow is the firm's lighting fixture expert, and the Bradenton operation offers contractors quality engineering service in taking off on construction projects.

This sprawling electrical supply organization has access to any line, and can supply area contractors with their every need from a single pole light switch or power tool to high potential transformers and the most complete array of fixtures in this section.

Mr. Braverman and Mr. Stark are partners with three branches under the masthead of Consolidated Electric Supply of Key West, one in Melbourne, and a unit in West Palm Beach.

Says Mr. Braverman: "Our affiliates in Consolidated Southern have no financial interest in these three branches."

On the other hand, Mr. Saltzman and Mr. Edwards own Central Electric Supply of Orlando and Major Electric Supply of Fort Pierce.

Other offshoots of this expanding organization include outlets in Jersey City, and Rye, N. Y. Mr. Braverman hopes to include several more branches on Florida's west coast in his over-all merger.

Brief news notes of manufacturers

PYRAMID INSTRUMENT Corporation, has changed its name to Amprobe Instrument Corp., Sam Koch, president, announced recently.

Pyramid designs, manufactures, and markets lines of clamp-on volt-ammeters, cable tracers, Remcon remote control lighting systems for both residential and industrial use, etc. The clamp-on volt-ammeters and cable tracers have been extensively advertised under the trade mark Amprobe and are widely used in electrical contracting, plant maintenance, electrical manufacturing, etc.

* * *

A NEW CONDUIT PLANT in Gilmer, Texas, is now being planned by Pittsburgh Standard Conduit Co.

Announcement of the new operation was made recently by Robert G. McIlroy, president of the company. The plant building will be built by the Gilmer Industrial Foundation and leased to Pittsburgh Standard on a lease-purchase arrangement.

The new conduit facilities will be located 19 miles from the pipe mills of Lone Star Steel Co., Longview, Texas, who will supply the necessary steel tubing for hot-dipped galvanized conduit production.

When the Gilmer plant starts in February, 1962, it will be the fourth conduit facility for Pittsburgh Standard.

News about people

The board of directors of the American Institute of Electrical Engineers has elevated four Southern AIEE members to the grade of Fellow for outstanding contributions to the profession, **N. S. Hibshman,** AIEE secretary, has announced.

Thomas W. Trice, vice-president, electric operations, Baltimore Gas and Electric Co., has been honored "for contributions to the management of engineering and operations of a major electric utility system."

Receiving the honor in Kansas City, Mo., was **Bruce J. Ennis,** associate, Burns and McDonnell Engineering Co., who was named "for contributions to the design and construction of electric power supply systems."

Harry R. Immich, division plant engineer, Southwestern Bell Telephone Co., was named a Fellow "for contributions to storm-proofing of intercity and rural communications."

The honor was also granted to **Earl L. Sitz.** professor of electrical engineering, Kansas State University, "for contributions to the teaching of electrical engineering."

Executive positions have recently been filled in two subsidiaries of Consolidated Electronics Industries. **Max D. Orr** has been elected executive vice-president of Advance Transformer Co.; **Robert B. Negele** has been appointed executive vice-president of Chicago Magnet Wire Co.; and **William Weber, Jr.,** has been named to take Mr. Negele's place as director of manufacturing for Advance.

Mr. Orr is credited with being largely responsible for building Advance Transformer Company into its present world market position. He was formerly vice-president and director of marketing. He is also past chairman of the Certified Ballast Manufacturers and a member of the finance committee of the IES.

Max D. Orr

John Q. Dickerson has been appointed a field engineer by Anderson Electric Corp., Leeds, Ala.

He was formerly a sales representative with the A. B. Chance Co.

Mr. Dickerson will work closely with Anderson's field sales force throughout the United States, according to **C. E. Bitzer,** sales vice-president.

Wakefield and Art Metal Lighting Div., Wakefield Corp., announce the

John Q. Dickerson

appointment of **Donald J. Watson** as their sales representative in Florida.

Mr. Watson will handle the complete fluorescent line of the Wakefield Division and the incandescent line of Art Metal.

For the past 15 years, Mr. Watson has served in various capacities in the electrical field and is well known in Florida and surrounding territories. He will cover the northern Florida area, serving the principal cities of Jacksonville, Daytona Beach, Orlando, and Tallahassee.

W. P. White, Jr., has been appointed executive vice-president of Appleton Electric Co., it was announced recently by **Arthur I. Appleton,** president of the company.

Mr. White was formerly associated with the Continental Can Co.

Two Southern appointments to sales positions have been announced by Thomas Industries, Inc., Louisville, Ky.

Gilbert W. Allen has been named

Operating Performance is the second of three vital "musts" for Service Entrance switches. The first is Electro-Mechanical Strength, the third—Load Break Dependability.

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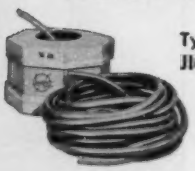

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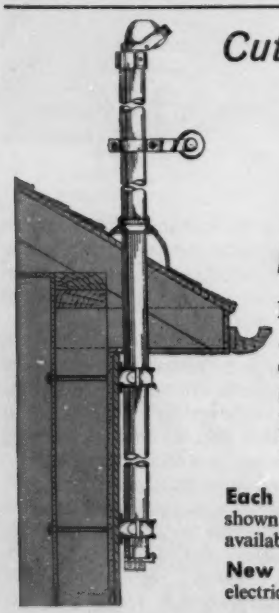

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EAST PALESTINE, OHIO

district sales engineer at Charlotte, N. C., and **Clifford W. Kuhlman** succeeds Mr. Allen as sales representative at Birmingham, Ala.

Both appointments are in the Lighting Div., **Thomas R. Fuller,** vice-president of sales, said.

Mr. Allen, who will represent Thomas Industries in North Carolina, South Carolina, and Virgina, joined the company more than three years ago. Previously, he was associated with Cary Chapman and Co., Birmingham, electrical manufacturers' representatives, and Hunter Fan and Ventilating Co., Jackson, Miss., an air handling equipment manufacturer. He graduated from the University of Tennessee with a BS degree in marketing.

Mr. Kuhlman will represent Thomas Industries throughout Alabama. He earned his bachelor's degree in commerce and marketing from the University of Louisville. He began work for Thomas in 1958.

Frank W. Edwards, an assistant to the vice-president of production and transmission at Duke Power Co., was installed as president of the Charlotte Engineers Club recently.

Another Duke executive, **Roy A. Palmer,** was presented the club's award for outstanding contributions to engineering.

Frederic B. Powers, Jr., secretary and director of the Rawlplug Co., Inc., New Rochelle, N. Y., has been elected a vice-president, it was announced recently.

He succeeds **M. M. Schubert,** who

F. B. Powers, Jr.

is retiring after 34 years with the company.

Mr. Powers joined the company's sales department after graduating from Fordham University in 1955.

New promotions in Underwriters' Laboratories have recently been announced by **Merwin Brandon,** president.

A. D. Lutgens was promoted to associate electrical engineer and will

assist the managing engineer at the Chicago office.

S. B. Swift was promoted to associate managing engineer and will assume the duties of section head in charge of the Signaling Device Section at the New York office.

D. O. Mithoug was promoted to senior project engineer at the Chicago office.

Mr. Lutgens graduated from Purdue University in 1937 with a BS in electrical engineering. He joined Underwriters' Laboratories in 1939 as an assistant electrical engineer. He was promoted to division engineer in 1951 and in 1957 assumed duties of associate managing engineer.

Mr. Swift graduated from Union College in 1944 with a BS in electrical engineering. He joined Underwriters' Laboratories in 1946 as an assistant engineer. He was later promoted to project engineer, and then to senior project engineer.

Mr. Mithoug graduated from Oregon State College in 1950 with a BS in electrical engineering. He joined Underwriters' Laboratories in 1953 as an assistant electrical engineer.

Richard C. Waldron has been named chief engineer at the Okonite Co., Passaic, N. J. wire and cable fabricating subsidiary of Kennecott Copper Corp.

He succeeds **Dr. Robert J. Wiseman,** who has retired, but who now serves as Okonite's cable consultant.

Immediately after his graduation from Harvard University in 1928, where he received his BS degree in electrical engineering, Mr. Waldron started his career at Okonite. His activities have involved work not only in the research, engineering and product development departments, but have also extended into the marketing division, where he has served since 1955 as manager of engineering.

Mr. Waldron initiated the development of rubber-insulated x-ray cables in 1934, when the only available cables for this purpose were made in Europe. He has been granted a number of patents for special joint designs and was co-inventor of "Dualay" self-supporting aerial cable.

T. M. Broderick has been named manager of motor sales for the Hunter Div., Robbins & Myers, Inc. Mr. Broderick, who left the Delco Products Division of General Motors Corporation to accept the newly created position, is a graduate of the General Motors Institute, Flint, Mich.

Two new factory sales representatives have been announced for Anderson Electric Corporation by **C. E. Bitzer,** vice-president in charge of sales.

Roy T. Anderson has been named to serve the northern Alabama, central Tennessee, and Kentucky areas.

Roy T. Anderson

He was associated with the sales and supply department of the General Electric Supply Co., Anniston, Ala., prior to his new appointment.

C. S. Phillips has been appointed to serve northwest Florida, southeast

C. S. Phillips

Mississippi, and the portion of Alabama south of Birmingham. He is a graduate of Auburn University with an engineering degree, and resides at 2951 Pine Haven Dr., Mountain Brook, Ala.

Southern States Equipment Corp. Hampton, Ga., recently announced three changes in its sales organization.

Bruce Smith, formerly district manager in the Southwest, has been appointed Midwest regional manager and will establish a sales office in St. Louis, Mo.

Justin A. Zager, Northern regional manager, formerly located in Buffalo, N. Y., is being transferred to the factory in Hampton.

M. A. Long, formerly in the company's internal sales organization, has been appointed field engineer and assigned to the Southwest regional office in Dallas, Texas.

John A. Schwenke has been named sales engineer for the northern half of Texas for S&C Electric Co.

His headquarters are located in the Fidelity Union Life Building, Dallas.

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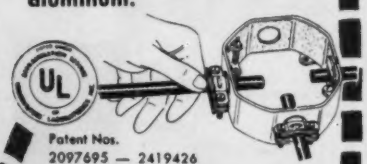

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Technical books

for the electrical man

Proposed Code revisions

"Proposed Amendments of the 1959 Edition National Electrical Code." Published by National Fire Protection Assn., 60 Batterymarch St., Boston 10, Mass., paperback, eight by five inches, 380 pages, $2.50.

Preparing for the publication of a 1962 edition of the National Electrical Code, the National Fire Protection Association has issued its publication No. 70-PR presenting all of the proposed amendments to the 1959 Code.

The proposed amendments are presented in order of Article numbers rather than by Code-Making Panels in order to simplify reference to the material. In each case, however, the Code-Making Panel responsible for the Article is indicated and the personnel of the panels are listed in the front of the publication.

The proposed amendments are divided into four subdivisions: proposals recommended; proposals rejected; proposals awaiting decisions; and proposals referred to other Code-Making Panels.

Mathematical reference

"Mathematical Handbook for Scientists and Engineers." by Granino A. Korn and Theresa M. Korn. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y., 960 pages, illustrated, 110 tables, $20.00.

This new professional reference is planned to provide helpful mathematical definitions, formulas, theorems, and methods for engineers, scientists, research workers, and others whose work involves the use of mathematics and its methodology.

Among the subjects covered in the handbook are algebra, analytic geometry, calculus, vector analysis, integrals, Fourier analysis, Laplace transforms, differential equations, Boolean algebra, tensor analysis, probability theory, random processes, correlation functions, numerical computation, and finite-difference methods.

For specific applications, each of the book's 21 chapters is arranged to permit the rapid review of a complete mathematical subject. Another feature of the book is the connected outline of mathematical models which are essential to exact scientific methods.

In addition, the handbook's detailed index makes a convenient mathematical dictionary—and individual chapter references and bibliographies guide the reader to more advanced treatment in specific areas of interest.

Both members of this husband and wife team have worked as engineers for a number of aircraft firms, and their experience includes background as industrial consultants of analog computer systems and military operations research. Professor and Mrs. Korn are co-authors of the book "Electronic Analog Computers."

Capacitor data and uses

"Understanding Capacitors and Their Uses," No. CAP-1, by William F. Mullin. Published by Howard W. Sams and Co., Inc., 1720 E. 38th St., Indianapolis 6, Ind., 96 pages, $1.95.

Designed to take the misinformation and mystery out of capacitors, this book's main purpose is to answer in practical terms the questions which arise from working with or studying electronic circuitry.

It is written in everyday language, and explains the principles of capacitor operation, describes the physical make-up and construction of various types, and also tells where different types are most often used and why. Points to consider in selecting suitable replacements are discussed, as well as practical information on how to test capacitors for opens, leakage, shorts, value, power factor, etc., and how to measure their values.

Among the topics covered in the book are fundamentals and theories of capacitors, capacitor construction, application, replacement, and testing.

The author, Mr. Mullin, is associated with a capacitor manufacturer, and through his book bridges the gap between engineering technology and circuit theory.

Radio and electronics

"Practical Radio and Electronics Course." Published by Supreme Publications, 1760 Balsam Rd., Highland Park, Ill., 35 lessons, illustrated, $3.50.

This book consists of a complete radio-electronics course of 35 lessons covering three principal areas: (1) practical radio, (2) applied electronics, and (3) radio servicing.

The lessons are clear, practical, and easy to master and use, according to the publisher.

Each page of the book is divided into two columns, a wide column for the text, and a parallel narrow one containing pertinent explanations usually supplied by a teacher.

Transistor studies

"Transistors: Principles, Design, and Applications," by Dr. Wolfgang W. Gaertner. Published by D. Van Nostrand Co., Inc., 120 Alexander, Princeton, N. J., 675 pages, 300 diagrams, $12.50.

All concepts needed by students and practicing engineers concerned with transistors are included in this new book, whose author is director of the Electronic Semiconductor Dept., CBS Laboratories, Stamford, Conn.

The book opens with an introduction to solid state physics and semiconductor properties. It also includes a description of transistor circuit design theory, and the last 11 chapters are an introduction to transistor applications. Diagrams illustrate typical circuits.

Since receiving his Ph.D. in physics from the University of Vienna in 1951, Dr. Gaertner has had extensive experience in the U. S. and Austria in solid state physics.

Principles of circuits

"Circuit Analysis," by Elias M. Sabbagh. Published by the Ronald Press Co., 15 E. 26th St., New York 10, N. Y., 528 pages, 480 illustrations, $8.75.

This basic textbook features a logical organization of material, the integrated treatment of a-c and d-c theory, and carefully selected problems to bring theory into a working sphere.

Divided into short chapters, the book covers the duality theory, detailed treatment of sinusoidal steady state, generalized S-plane, signal-flow diagram, and derivation and application of the Fourier series.

Clear instruction in the use of network graphs, simple matrix algebra, and complex frequencies is given in the text, which includes chapters ranging from "The Electrostatic Field and Capacitance" to "Equilibrium Equations for More General Circuits" and "Magnetically Coupled Circuits."

Elias Sabbagh, the author, has taught electrical engineering at Purdue University since 1928, and received the university's "Best Teacher Award" in 1946. He is a consulting engineer and educational consultant for the Allison Div., General Motors, and a former consultant for General Electric.

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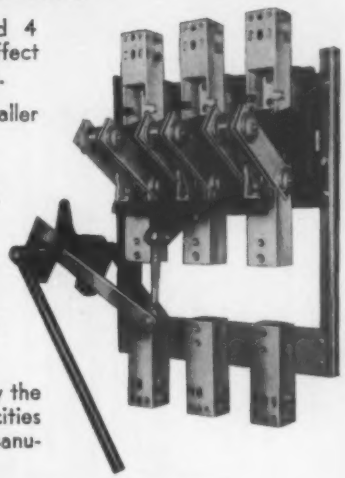
1200-6000A 250 and 480 volts



- Hollow terminals, twin jaws and 4 blades per pole give less skin effect heating and more cooling surface.
- Switch is more compact for smaller switchboard dimensions.
- Contact pressure mechanism has no springs, solder or cotter pins. Self-locking in closed position.
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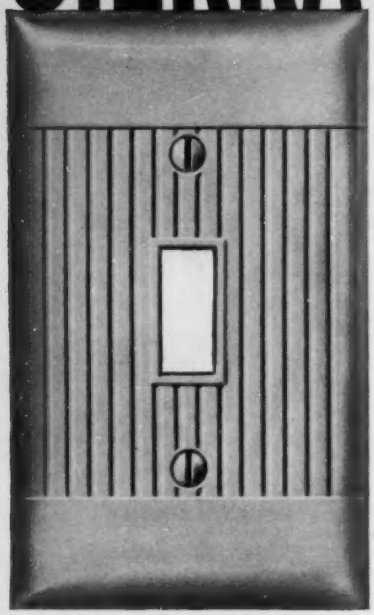

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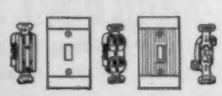


New products

New Ettco-Flex PJ cable

The all new Ettco-Flex non-metallic sheathed cable (type NM), from Ettco Wire and Cable Corp., 46-50 Metropolitan Ave., Brooklyn 37, N. Y., is now P. J. (plastic jacketed).

The new Ettco-Flex P. J. is one of the first completely new products of its kind in the cable industry for over a quarter of a century.

The superior Ettco-Flex P. J. features much smaller diameter than almost any other competitive product, easier stripping, no messy paper wraps, no sticky saturants, extremely smooth and easy pulling through joists and beams (no snagging or ripping of plastic jacket), all sizes with and without ground wire, and packaging in a convenient carton.

Write P-919 on reply card, p. 21

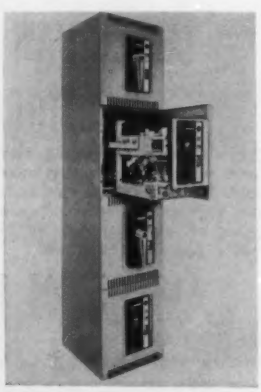
Federal Pacific switchgear

A new design of power switchgear to meet the more severe requirements of modern electrical systems was introduced recently by Federal Pacific Electric Co., 50 Paris St., Newark 1, N. J.

The major significance of the new breaker to the user is the economy provided by the uprating of the individual breaker sizes. Previously, industry standard sizes for units of this type were 225-, 600-, 1,600-, 3,000-, and 4,000-amperes; with the FP line the ratings of the first three sizes have been raised to 400-, 800-, and 2,000-amperes. This permits use of a smaller unit in the initial installation and the greater capacity for load growth in these new breaker ratings will save the user up to 50 per cent on his investment in switchgear.

A second important advantage of FP breakers is that they allow use of the more efficient "selective" protective system without paying a substantial price. By raising interrupting capacities of the three smaller breakers to 50,000 amperes asymmetrical and the larger breakers to 100,000 amperes, up to 100 per cent above previous I.C. ratings —the new Federal Pacific units provide protection in line with the higher levels of fault currents that can occur in the large power equipment employed in modern distribution systems.

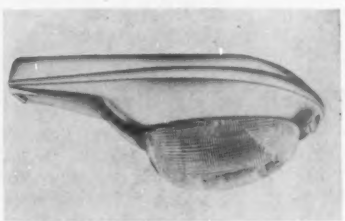
Write P-920 on reply card, p. 21



Revere mercury luminaire

A new mercury luminaire has been added to the line of modern street lighting luminaires now available from Revere Electric Manufacturing Co., 7420 Lehigh Ave., Chicago 48, Ill.

Called the "Unitized Endoval," the new 2600 series luminaire is designed for wide, heavily traveled streets and is offered with or without built-in constant-wattage or high-power-factor reactor ballasts. It is also available with a mounting adapter for EEI-NEMA standard plug-in locking-type photoelectric control.



The Unitized Endoval uses 250- or 400-watt mercury lamps to provide high-level, glare-free lighting. Adjustable socket positions produce ASA-IES types II, III, or IV with proper choice of lamp. The unit is designed to fit either a 1¼-inch or a two-inch pipe mounting arm.

Write P-921 on reply card, p. 21

Westinghouse furnace

A thermostat-controlled, forced-air electric furnace, now available from the Westinghouse Electric Corp., P. O. Box 2278, Pittsburgh 30, Pa., maintains even temperatures without recycling through the use of a unique "sequencer" control unit.

The furnace is available in two cabinet sizes and six heat ratings from 34,000 to 119,000 Btu's. The Btu ratings vary with the number of heating elements used in the unit. Lowest rated, the 34,000-Btu model

uses only two elements while the highest rated 119,000-Btu model requires seven elements.

The "sequencer" control unit, which may control up to seven heating elements depending upon the furnace rating, energizes only enough elements to supply the heat needed to satisfy the thermostat setting. Heating elements are energized at random, one at a time, until the correct temperature is achieved. There are never more elements in operation than are actually needed, and each one has its own limit control and shuts off automatically if overheating occurs.

Completely enclosed and insulated with one-inch-thick vinyl-coated glass wool, the furnace can be operated vertically, horizontally, or upside down (counterflow) with only a minor change in the placement of the controls.

Although it can be used alone, the electric furnace is specially designed to become part of a "Total Comfort" system—a fully integrated system consisting of heating and air conditioning, air purification and sterilization, and dehumidification.

Write P-922 on reply card, p. 21

Sileps safety stud driver

A new power stud driver built by Sileps, Inc., P. O. Box 3721, Charlotte 3, N. C., overcomes the danger to operators that is characteristic of many other such drivers.

Fixrammer model Control-A-Stud does not work on the basis of power from velocity as conventional stud drivers, thus eliminating chances of ricochets. Power is transmitted directly to a plunger which is then moved at a relatively slow speed, actually pushing the stud into the material.

The stud automatically stops when the plunger discontinues pushing it. Breakage of concrete around the stud (spall) is also eliminated. If a stud has not penetrated to its proper depth for any reason, it may be reclaimed by pushing it farther into the material via another charge.

Since powder marks have been eliminated through a special gas control chamber, control-A-Stud may also be used on finished (inside) surfaces. The device can also be used for driving studs into hard concrete, thick steel, soft cinder blocks, or inconsistent masonry, with a special powder charge.

An automatic control system regulates the depth of penetration and stops the stud from coming through the opposite side.

Write P-923 on reply card, p. 21

Sierra narrow wall plates

A new line of narrow plates has been announced by Sierra Electric Corp., 15100 S. Figueroa, Gardena, Calif.

These new narrow plates are available in most popular device openings and in seven narrow widths:

1-3/8, 1-1/2, 1-11/16, 1-3/4, 2, 2-1/4, and 2-1/2 inches. All have a standard 4-1/2-inch height.

Sierra narrow plates may be specified in brass, stainless steel type 430 (for normal use), and stainless steel type 302 (for severe corrosive conditions). Although these plates are much narrower than other Sierra wall plates, the design and contour of these plates match the company's standard-sized plates.

Narrow plates have many applications including trailers, mobile

NONE BETTER
than
KNOX
PORCELAIN
RECEPTACLES
No. 1736
No. 1924
OPEN-TOP WIRING — ready for immediate wiring — speedy and easy installation without removal of the interior mechanism. DUST-PROOF (Completely enclosed) INTERIORS with extra large binding head screws that are backed out and staked. Replaceable interior gives absolute satisfaction on full rated loads with performance that far exceeds Underwriters' Standards. Porcelain Receptacles No. 1736 and 1924 are pull-chain, three piece with shadeholder groove. For 3¼" or 4" box.
No. 1734 is our all-time favorite, with shadeholder groove. For 3¼" or 4" box. Complete with chain and cord.
No. 1634 Keyless receptacle with shadeholder groove. For 3¼" or 4" box.
Always Specify KNOX Wiring Devices
KNOX PORCELAIN CORPORATION
KNOXVILLE 1, TENNESSEE
Send for Literature

For more details on above items, use reply card on page 21

homes, boats, movable partitions, laboratory and educational furniture, food processing equipment, etc.

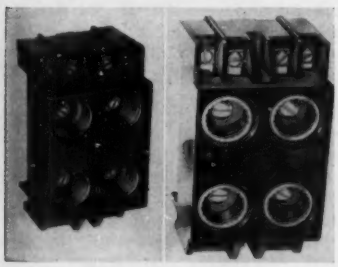
Write P-924 on reply card, p. 21

Arrow-Hart fuse block

The Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford, Conn., has available a four-circuit plug fuse block that is interchangeable with 30-ampere and 60-ampere pullouts in its 100/200-ampere add-on service equipment line.

The new fuse block is designed to permit easy installation of additional 15-, 20-, and 30-ampere fused branch circuits to meet present and future residental electrical needs with existing entrance equipment.

Ideally suited for electric heat installations, the new four-circuit block has opposite polarity, and will not unbalance loads. By giving greater flexibility to this equipment, the new four-circuit block increases the ability of contractors to meet any installation requirements, yet keeps distributors' supplies at a minimum.



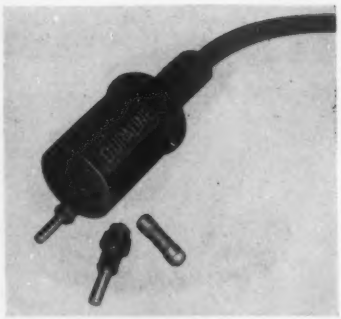
The new interchangeable four-circuit fuse block is available in two types. Model CP-215 will take 15-, 20-, and 30-ampere fuses and features safe, dead-front construction and screw connections that insure positive contact at all times and guard against overheating. CPS-215, which is identical, is designed to accept type S fuses only (0-15 amperes) which prohibits overfusing.

Write P-925 on reply card, p. 21

Nottingham plug-in system

A plug-in distribution system for electrical resistance preheat and stress relief, with safety-fused plugs to protect equipment and personnel, has been introduced by J. B. Nottingham & Co., Inc., 441 Lexington Ave., New York, N. Y.

Three-prong plugs mate with outlet receptacles on primary distribution blocks and two-prong plugs with secondary block outlets. To prevent overloading when heaters are added, plugs have fuses at the base of each prong, readily unscrewed for access



to the fuse. To protect personnel, fuses can be changed only after plugs are disengaged.

Properly mating a plug with its block makes a low-resistance, sealed connection. Plug-in terminals, polarized to prevent mismating, automatically ground each unit as it is connected. Heavy-duty neoprene-molded construction provides electrical insulation and physical protection.

Write P-926 on reply card, p. 21

Alan-Lea magnetic level

The Lev-L-All, an all-purpose magnetic level for flat and curved surfaces, has been announced by the Alan-Lea International Inventions Corp., 380 Lexington Ave., New York 17, N. Y.

The device is specifically engineered to do a multiple of fast, accurate leveling jobs. Its design gives it a wide application in the electrical trade for all leveling jobs including making perfectly aligned pipe bends and pipe fabrication.

One easy-to-read bubble gives an accurate 45-degree, 90-degree, or horizontal reading. This eliminates

the need for at least three bubbles as used in most conventional levels to get the same readings. Rugged and compact, the Lev-L-All is 3⅜ inches long, 1½ inches high, and ⅞ inches wide. It weighs 2½ ounces.

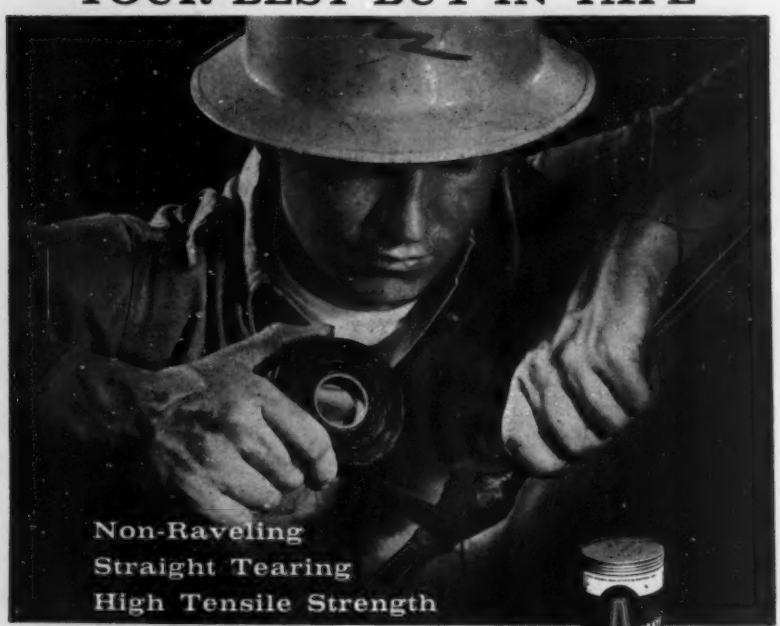
Its Alnico permanent magnets are concealed within its plastic body which is heat, cold, and moisture resistant.

Write P-927 on reply card, p. 21

G-E contactors and starters

New, smaller contactors and starters in NEMA sizes 3 and 4, that offer reductions in panel space require-

YOUR BEST BUY IN TAPE



ACCURATE TAPE ACCURATE MANUFACTURING CO
Garfield, New Jersey

ments up to 25 per cent in the critical height dimensions, have been added to the series of 100-line controls available from General Electric Co., General Purpose Control Dept., Bloomington, Ill.

With the addition of these new forms to the 100-line, the company offers contactors and starters from sizes 00 through 4 which provide lighter weight, easier installation, and faster inspection and maintenance.

In addition to smaller size, another major benefit of the standardization is easier maintenance. Training maintenance personnel to install, inspect, and repair these new devices is simple because all principal components are accessible for quick, easy inspection and maintenance without even using a screwdriver. Wiring is not disturbed during coil change or contact inspection.

Write P-928 on reply card, p. 21

Fused interrupter switch

The Loadmaster 100, a 600-volt fused interrupter switch, is now available from Pennsylvania Transformer Div., McGraw-Edison Co., Box 330, Canonsburg, Pa., as an individually enclosed unit.

Production of the switch as an individually enclosed unit, with full drawout construction, makes it possible to apply the high-interrupting capacity and safety features of this device to service entrances and other electrical system applications having high fault capacities. The switch is available in 800- and 1,600-ampere models.

The individually enclosed unit is suited for heavy-duty industrial applications where dependability and safety are mandatory. It offers economical protection for existing motor control centers and switchboards which are being applied above their interrupting capacity. The individually enclosed switch can also provide effective protection at lower cost on individual low-voltage feeders to new equipment.

Overload and fault protection in the device is provided by Buss low peak dual-element current-limiting fuses, which provide a close-in and interrupting rating of 100,000 rms symmetrical amperes.

Write P-929 on reply card, p. 21

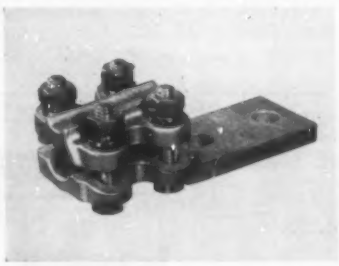
Penn-Union terminal lugs

Penn-Union Electric Corp., 315 State St., Erie, Pa., has announced the addition of a complete line of wide range bronze terminal lugs.

The terminal line features a wide range reversible cap of high strength bronze and a four-bolt clamping design on all sizes. Bolts are made of silicon bronze and a choice is given of one-, two-, or four-hole NEMA tongues.

An additional selection of straight, 45-, or 90-degree angle tongues is available.

The reversible cap feature requires only five terminal lugs to cover the application of any cable size from No. 8 solid through 2,000,000 stranded copper conductor. A total of three connectors may be selected to cover this full cable range and still retain good cable enclosure for any specific conductor.



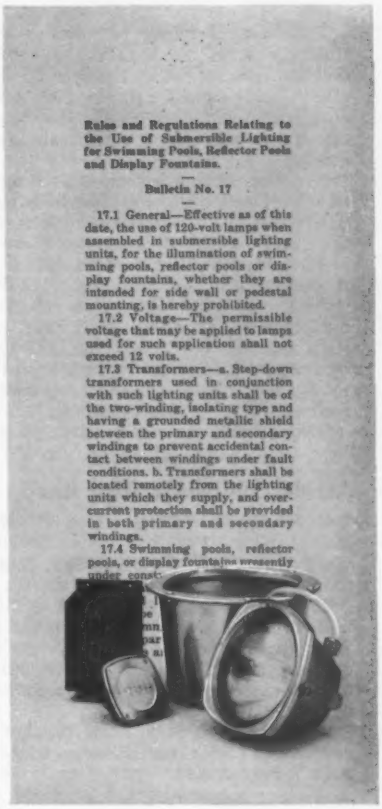
Use of a high conductivity body and four-bolt clamping provides a heavy-duty, all-purpose terminal for almost any cable to flat application.

Write P-930 on reply card, p. 21

Emerson heat control system

A new, low-cost, automatic set-back control system, designed to reduce heating cost 20-50 per cent in motels, schools, churches, and residences, is announced by Emerson Electric Manufacturing Co., 8100 Florissant, St. Louis 36, Mo.

The new set-back control lowers or raises the temperature of unoccupied rooms by remote control, greatly reducing heating and power costs. With the flick of a switch at the central control panel, the thermostat in a room drops to "low" or goes up to "normal." The occupant, however, in the motel unit, the classroom, etc., can still adjust the temperature at any time.


Rules and Regulations Relating to the Use of Submersible Lighting for Swimming Pools, Reflector Pools and Display Fountains.
Bulletin No. 17
17.1 General—Effective as of this date, the use of 120-volt lamps when assembled in submersible lighting units, for the illumination of swimming pools, reflector pools or display fountains, whether they are intended for side wall or pedestal mounting, is hereby prohibited.
17.2 Voltage—The permissible voltage that may be applied to lamps used for such application shall not exceed 12 volts.
17.3 Transformers—a. Step-down transformers used in conjunction with such lighting units shall be of the two-winding, isolating type and having a grounded metallic shield between the primary and secondary windings to prevent accidental contact between windings under fault conditions. b. Transformers shall be located remotely from the lighting units which they supply, and overcurrent protection shall be provided in both primary and secondary windings.
17.4 Swimming pools, reflector pools, or display fountains presently under

LIFESAVER

Underwater lighting is serious business.

Deadly serious.

Cutting corners can cost lives.

Precisely why the Stonco line is solid cast bronze. Porosity-tested. With a special low voltage transformer for safety plus.

(We've tamed the high voltage. Isolated it with a grounded shield that stops cross-over from primary to secondary. Harnessed it with a fuse factory-sealed to guard against do-it-yourself electricians.)

Even the deck box is gasketed watertight fore and aft. Keeps wiring bone dry. From surface slop, seeping water, or pool overflow caused by flash floods.

No wonder Stonco submarine lighting meets all the safety codes.

Incidentally, even our fountain lights are available low voltage.

Fish have to live too.

STONCO lighting

Write for Catalog G.

© 1961 STONCO ELECTRIC PRODUCTS CO.
KENILWORTH, NEW JERSEY

For more details on above items, use reply card on page 21

Specially designed to operate efficiently with all Emerson Electric electric heating units, the system installation is simple, requiring no special equipment. No costly, low-voltage transformers or relays are required.

Another saving advantage of the new set-back control is that both the "high" and the "low" operations of the thermostat are regulated. "Low" is not "off" so that a room will not freeze if the outside temperature should suddenly drop, or if the temperature rises, no heat will be supplied. The thermostat has a limited range of adjustment—65 F ("low") to 80 F ("high")—preventing overcontrol by the room occupant.

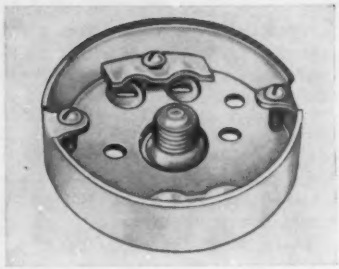
Write P-931 on reply card, p. 21

Arrolet shallow ceiling box

The Arrolet Corp., Bower St., Montgomery, Pa., has recently revised their shallow ceiling box, commonly known as a pancake box.

The new design features give this box wider and more convenient use. A new clamp screw design now passes through the bottom of the box, allowing easier handling and faster adjusting time.

This ceiling box is ideal for low-cost construction and is very adaptable for new and remodeling work.



The box is compact and easy to maneuver in small areas.

Specifications are 3¼-inches in diameter, available in ½- or ¾-inch depths, available with ½-inch knockouts in bottom or with stud, furnished with or without clamps, and clamps available for either non-metallic cable or armored cable.

Write P-932 on reply card, p. 21

Pyle-National wiring device

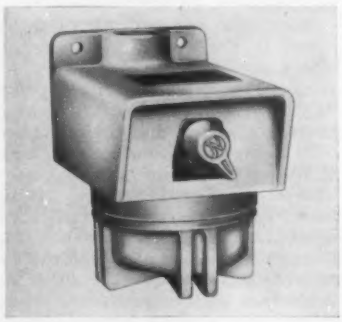
Shielded controls and threaded construction throughout provide unusual protection for the relatively delicate wiring devices housed in the new explosion-proof, dust-ignition-proof, and weather resistant (raintight) fittings now available from the Pyle-National Co., 1334 N. Kostner Ave., Chicago 15, Ill.

This protection is of particular advantage when the fitting is exposed to process drippings. The fittings are identified as EW series Pylets. They are available with various standard wiring devices including tumbler switches, manual motor starters, pushbutton stations, selector switches, and pilot lights.

All operating controls have a threaded stainless steel shaft and are conveniently mounted on the front face of the body. Each is equipped for padlocking in any position.

Bodies are regularly tapped at top and bottom for half- to one-inch conduit. The back and both sides can also be tapped up to one inch when specified.

Write P-933 on reply card, p. 21



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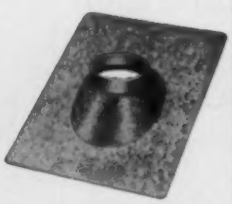
Electrical Contractors and Electricians Are Taking Advantage of A New Evans Product to Build Mast Type Electrical Entrances.

Evans Roof Flanges provide lifelong leakproof protection and meet any building specification. A choice of three metals—galvanized, aluminum, and cast lead are manufactured to meet every requirement.

You'll find Evans Roof Flanges economical to use. Contact your Wholesale electrical supply jobber today.



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NEW! EXTRUDED ALUMINUM SHUTTERS

With Completely Concealed Pivot Pins

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ELGO Shutters Give You All these advantages

- Light Weight
- Full Weather Strip
- Low Freight Cost
- Easier Installation
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- Natural aluminum finish with fluted frames.

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Helpful literature

available to our readers

A 24-page booklet, "Enclosures Unlimited," describes the NEMA **enclosures**, both fabricated and cast, from **James F. Burns Co.**, 1601 Industrial Hwy., Pennsauken, N. J. Full catalog data and illustrations are included.

Write B-934 on reply card, p. 21

An illustrated brochure from **Sundial Electric Corp.**, 130-15 89th Rd., Richmond Hill 18, N. Y., gives complete descriptions and installation data on the company's line of electric **baseboard heaters.** Specifications and ordering information are also included.

Write B-935 on reply card, p. 21

Advanced design features of **600-volt switchgear** with K-Line circuit breakers are described in a new two-color bulletin published by **I-T-E Circuit Breaker Co.**, 1900 Hamilton St., Philadelphia 30, Pa. The 20-page bulletin, No. 3200-1A, provides comprehensive information on low-voltage power circuit breakers and switchboards, ranging in unit ratings from 225 to 4,000 amperes.

Write B-936 on reply card, p. 21

Bulletin TIA-182, from **General Electric Co.**, 1 River Rd., Schenectady 5, N. Y., gives detailed information on the features and application of the company's completely new Locke **line post insulators** which incorporate new wide wire grooves, higher mechanical strength, and a special modern seal.

Write B-937 on reply card, p. 21

Kliegl Bros., 321 W. 50th St., New York, N. Y., has recently published a complete catalog of U.L. listed **control systems for public buildings.** The new 38-page manual features the recently U.L. listed silicon-controlled rectifier dimmers. It also covers autotransformer dimmers, Safpatch and Rotolector cold patching (contact made in a de-energized circuit) systems, consoles, and programmers, together with complete product and system specifications.

Write B-938 on reply card, p. 21

A special brochure on the application of the U. S. Varidyne all a-c **controlled speeds systems** to range drives (for paper, fabric, plastic, and metal strip) is now available from **U. S. Electrical Motors, Inc.**, P. O. Box 2058 Terminal Annex, Los Angeles 54, Calif. Featuring pushbutton speed control and automatic coordination of multiple-motor range drives, the brochure tells how the frequency control of speeds in a-c squirrel cage motors (U. S. Varidyne system) permits motors to start, stop, etc., while running.

Write B-939 on reply card, p. 21

Many of the lighting problems in modern industry are discussed and analyzed in the new **high-bay lighting** catalog offered by the **Benjamin Div., Thomas Industries, Inc.**, 207 E. Broadway, Louisville, Ky. The first few pages define some of the basic factors involved in solving industrial lighting problems.

Write B-940 on reply card, p. 21

A colorful portfolio containing a new headerduct catalog and an outlet and fittings catalog is now off the press from **General Electric Co.**, Conduit Products Dept., McKees Lane, Niles, Ohio. Both catalogs contain new illustrations and data on **underfloor distribution systems.** The portfolio gives a resume of the new and improved cellular-floor header system, specifically designed for all types of cellular-steel floors for high and low tension electrical service.

Write B-941 on reply card, p. 21

A wide selection of low heat rise **rapid-start ballasts** for 430-, 800-, 1,000-, and 1,500-ma use is included in the new catalog being offered by the **Universal Manufacturing Corp.**, 29-51 E. Sixth St., Paterson 4, N. J. Covered are 20 different ballasts available for operation of one, two, or three lamps at 118 (120), 236, or 277 volts. CBM certified ballasts for indoor or outdoor applications with reliable starting at ambient temperatures as low as -20 F are described, along with complete specifications.

Write B-942 on reply card, p. 21

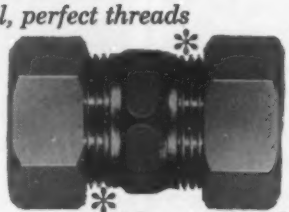
A two-color, 24- by 36-inch wall chart from **Pass & Seymour, Inc.**, Solvay Station, Syracuse 9, N. Y., contains illustrations and brief technical descriptions of more than 100 of the most popular **wiring devices.** Handy for reference, the chart has space at the bottom for writing the name and address of the distributor.

Write B-943 on reply card, p. 21

A 30-page catalog issued by **Western Insulated Wire Co.**, 2425 E. 30th St., Los Angeles 58, Calif., gives complete data about Bronco multiconduc-

COMPARE *

Blackhawk's full, perfect threads



with any other fittings on the market

See for yourself that Blackhawk EMT fittings have full, true, perfect threads for ease and speed of installation. Bodies of heavy steel or malleable iron — cadmium and zinc finished to eliminate corrosion on the unit itself. Blackhawk's new EMT fittings are rain tight. Quality controlled at every phase of the manufacturing. Available in complete range of sizes.

Find out why these small, easy to use fittings are best for any electrical job, large or small.

SEND THIS COUPON TODAY

COMPARE BLACKHAWK'S FULL PERFECT THREADS
SEND FOR YOUR FREE SAMPLE
Blackhawk Industries, Box 708, Dubuque, Iowa (Dept. ES41)
Please send my free sample of Blackhawk fittings.
Name
Address
City State

Blackhawk Industries, Dubuque, Iowa
Where the new ideas come from

Pipe or Conduit Hangers

Most complete line with addition of 2 new sizes to oldest established standards in the industry.

The saddle or pipe support can be turned 360°, permitting pipe to run parallel or at right angle.

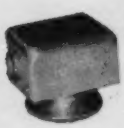
Excellent for confined areas—No drilling—no use of straps.

Made of the highest grade malleable iron, with case hardened set screw—all cadmium plated. For Aluminum, write for details.

For hanging ½" thru 2½" pipe or conduit to steel beams ⅜" thick.

Short Stem
TELEPHONE
DUPLEX
NOZZLES

These modern, flanged, short stem duplex telephone and receptacle nozzles can be used with all types of "Latrobe" boxes and come in satin brushed brass or anodized aluminum. Standards fit ½" opening. 3/4" stems are available, also grounded type receptacles.



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MANUFACTURING
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tor **electrical cables** used in control circuits. The first section of the book describes the extra flexible Bronco 66 certified 600-volt line ranging from five to 60 conductors in sizes 18 through 10 AWG, as well as shielded and station control cables.

Write B-944 on reply card, p. 21

Three catalogs on **metal paints and finishes** have been published by **Subox, Inc.**, Hackensack, N. J. Catalog No. 61A describes the technical features of producing rust-inhibitive paint; No. 61B gives colors for anti-corrosive primers and heavy-duty finish coats; and No. 61C gives details on anti-corrosive gloss paints and decorator finishes for industrial uses.

Write B-945 on reply card, p. 21

Feedrail Corp., 125 Barclay St., New York 7, N. Y., has issued a 44-page bulletin (No. 85) cataloging their 100-ampere, steel-enclosed trolley **busway industrial electrification** system and 100-ampere continuous service, 150-ampere intermittent service, and crane and hoist electrification system.

Write B-946 on reply card, p. 21

A new 24-page catalog, No. 10-1, available from the **Power-Strut Div., Van Huffel Tube Corp.**, Warren, Ohio, illustrates basic, slotted channel, fluorescent hanging systems and fittings; beam clamps; concrete inserts; and framing fittings for every **electrical support** need.

Write B-947 on reply card, p. 21

Underground system

(Continued from page 78)

9.0 kw per unit, ten have 9.94, and four have 11.74.

Service to the project is provided by Covington Electric Cooperative, which serves the town of Brantley.

Reverse polarity relay

(Continued from page 76)

circuit and then have the relay in the control circuit operate a circuit breaker.

Tests were run using a six-plate, 300-ma dry junction rectifier using a six-volt relay in a six-volt circuit. The same test was run using the same rectifier unit, a 12-volt relay in a 12-volt circuit, also, the tests were run on a 24-volt circuit and on a 150-volt circuit using the same rectifier but with a resistor in series with the relay because the relay was designed for a lower voltage.

In each instance the reverse polarity relay operated satisfactorily and the temperature of either rectifier or relay did not rise appreciably.

Meter panel

(Continued from page 67)

the operating cycle counter and the first month's readings indicated that the compressor was short-cycling. To determine whether or not this was true, an operating cycle counter was assembled from spare parts in the meter shop and was installed on the panel the following month. Subsequent readings have proved the counter to be of value by indicating when there was a need for adjustments in the equipment to maintain efficient operation.

The following data is obtainable from the readings of the meters on the memo meter panel:

(1) Kilowatthours for operation of indoor fan when only fan operates on manual control.

(2) Kilowatthours for cooling operation of compressor and fans.

(3) Kilowatt recorded demand of cooling operation of compressor and fans.

(4) Hours of operation of compressor and fans on cooling cycle.

(5) Kilowatthours for heating operation of compressor, strip heaters, and fans.

(6) Kilowatt recorded demand of heating operation of compressor, strip heaters, and fans.

(7) Hours of operation of compressor and fans on heating cycle.

(8) Number of operating cycles of heat pump compressor.

The memo meters are read each month by the regular meter reader at the time the customer's meter is read for billing. The customer is cooperating in this test by recording the indoor temperature and humidity readings once each morning and once each afternoon.

Records will be compiled for a 12-month period, thereby covering the total annual requirements for cooling and heating.

Efficiency of operation of the equipment under test can be readily determined by analyzing the charts and readings obtained from the panel.

Because of its portability and ease of installation the analytical memo meter panel may be used at other locations. It can be adapted to various sizes of installations simply by changing the ratio of the transformers used with it.

Data obtained from its use should be of great value to operating and sales personnel in determining the actual requirements and the performance characteristics of various types of installations.

System voltage

(Continued from page 76)

ating voltage above 105 per cent will have on core heating and service life.

When a safe operating voltage limit is established, it is then possible to evaluate the vars which are available at the receiving end from the remote source of reactive generation. The effect of an increase in sending end voltage can be illustrated by again referring to the system illustrated in Figure 9.

For a receiver voltage V_2 constant at 1.0 p.u., a sending end power input P_s of 110 megawatts, and sending end voltage V_1 equal to 1.05 p.u.; the reactive flow at the receiving end Q_r is -10.8 megavars* out of the line. Keeping V_2 and P_r constant at 1.0 p.u. volts and 110 megawatts, respectively, an increase in the sending end voltage V_1 to an assumed operating limit of 1.10 p.u. volts increases the reactive Q_r at the receiving end to -41.2 megavars.

Therefore, if the higher system voltage were obtainable on the system being considered in this illustration, and the maximum power expected on the transmission line were 110 megawatts, a contribution of approximately 40 megavars could be expected from each line separating the load from the generation.

Figure 11 shows the change in receiving end megavars Q_r and line loss $P_s - P_r$ when sending end voltage is varied from 105 to 110 per cent volts.

Five factors for evaluating system voltage have been reviewed. An implication of the above discussion is that selection of voltage operating levels on the transmission system is dependent upon many system variables affected by the generation, transmission, and distribution of power. Therefore, the needs of the system as a whole must be considered before optimum voltage operation can be realized.

(1) A minimum voltage limit common to all substations can be established at system peak load which will express the amount by which the transmission voltage can sag and still have sufficient boost in the substation transformer tap changer to restore the customer's voltage to normal.

*The negative denoting a flow out of the line or in a direction opposite to the assumed positive direction of flow shown in Figure 9.

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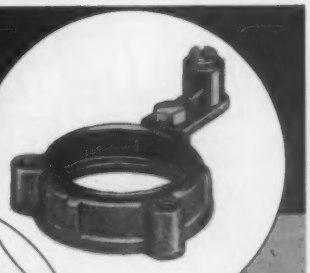

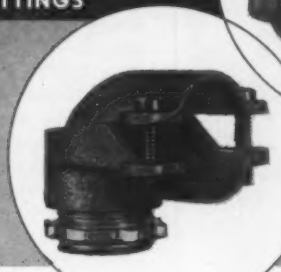

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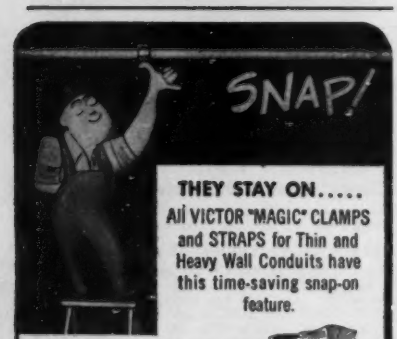

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Transformer fixed taps can be adjusted to permit normal operation of the transmission system voltage above the minimum voltage limit so that a margin exists to allow for system contingencies.

(2) A maximum voltage limit that applies to all substations can be determined for minimum load when all the buck taps of the substation transformer are utilized. This limit can be used to provide a basis for scheduling of system voltage at minimum system load.

(3) A minimum allowable voltage at tapped load points on an interconnection may necessarily impose a limit on the amount of power which can be transmitted across a tie. However, factors other than voltage may limit the amount of power transfer. Knowledge of the voltage coincident with the maximum power flow is useful in designing the intermediate substation to operate normally during heavy interchanges.

(4) The generating station "pull out limit" should be evaluated to determine if minimum kilovar generation is restricted by generator terminal voltage or steady state stability.

(5) The transfer efficiency of power supplied from remote generating stations is affected by the sending end substation voltage. The most efficient transfer of power is accomplished by supplying vars from the sending end to minimize transmission line loss.

(6) The remote generating station may have the ability to supply vars to the receiving end. An evaluation of the quantity of vars that can be received on peak will affect the var generation requirements at the receiving end.

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Big derrick

(Continued from page 73)

trol station. Georgia Power construction crews have commented favorably on the fact that it has been installed so that the operator can at all times face in the direction necessary to observe work of the derrick.

"We've already obtained top results with the vehicle in Augusta and Atlanta," Mr. Greene said, "and in each of these two cities we were setting poles under conditions which, using equipment previously in use, could only have been described as 'very difficult.'"

He pointed out that 95-foot poles weigh between 8,000 and 9,000 pounds, exclusive of crossarms. "When setting poles of this weight and length in crowded city areas," he said, "it's not enough to have equipment that 'we think' will do the job or which we believe is 'fairly safe.' We know from experience this definitely will do the job and it will do it with a minimum of effort and the maximum of safety."

Metering switchboard

(Continued from page 71)

site to meet changing job requirements.

I-T-E Uni-Power metering switchboards are available in a number of variations to suit users' needs.

Main sections may be obtained with meters back and front, on one side only, or without meters. Distribution sections also are available with meters back and front, on one side, or with main lugs only.

Main disconnects can be two- and three-pole fused switches or circuit breakers, rated from 225 to 1,200 amperes. Distribution disconnects are 15- through 100-ampere circuit breakers.

Standard watthour

(Continued from page 70)

These are but a few examples of the considerations given to details in the design of this precision standard for the watthour.

The standard cell used with the K-2 potentiometer is compared with a bank of five cells. Every two months one of these cells is compared against a bank of saturated cells.

The calibration of the three IBL-10 standards is checked monthly by watt-time checks using the Elliott Brothers a-c/d-c comparator and Berkeley electronic time interval meters.

The test runs, at both 1.0 and 0.5 power factor, are for approximately 108 seconds; the time being measured to the nearest millisecond. Semiannual checks

are performed on a total of 57 points with the National Bureau of Standards using three IB-10 portable watthour standards as transfers. These are used solely for this purpose and are not subjected to routine laboratory or factory use.

The data from these checks are analyzed and compared with the average of the watt-time checks to determine the agreement between the standard watthour as maintained by the General Electric Meter Department and that maintained by the National Bureau of Standards.

This value of the watthour is effectively transferred to all the factory and laboratory meter test equipment by means of a rigorous testing schedule. Information feedback loops are maintained to assure a high level of calibration accuracy of the outgoing meters.

This equipment and these methods have resulted in a value of the watthour that has consistently agreed with the National Bureau of Standards within 0.02 per cent for 1.0 power factor loads and 0.05 per cent for 0.5 power factor loads. (A summary of some of the load points checked in the last semiannual tests with NBS is shown in Table I.)

Code application

(Continued from page 53)

double locknuts are not permitted to be depended upon for bonding. Bonding jumpers with approved fittings are required to be used.

(3) In areas where lightning is prevalent, each ungrounded service conductor in a Class III location which is supplied from an ungrounded, overhead supply system is required to be provided with a lightning protective device. These devices must be connected to the service conductors on the supply side of the service disconnecting means. They must also be bonded to the service conduit.

(4) A wiring system in a Class III location which is supplied from a grounded a-c system and which has a grounded service conductor is required to have the grounded conductor, the metal raceways and enclosures, the equipment grounding conductor, the main grounding conductor, and the grounding electrode bonded together on the supply side of the service disconnecting means.

(5) A wiring system in a Class III location, which is supplied from a grounded a-c system in which there is not a grounded conductor as a part of the service, is required to have the supply system ground and the service raceway bonded at the service equipment. This bonding conductor is required to have a current-carrying capacity of not less than 1/5 that of the service conductors and in no case smaller than No. 10 if of soft copper or No. 12 if of medium or hard drawn copper.

(6) Where it is necessary to abandon one or more grounding connections to prevent an objectionable flow of current over the grounding conductors, the connections discussed in Paragraphs (4) and (5) above are not permitted to be abandoned while any other grounding connection remains connected to the supply system.

The above requirements for grounding Class III systems and equipment are identical with the requirements for grounding such systems and equipment in Class II locations which were discussed with the aid of sketches last month.

However, a repetition of rules which apply to different equipment or similar equipment in different locations is believed to be preferable to omitting such details entirely except by reference, since the material so referred to may have been misplaced or entirely missed by some.

There are no requirements for sealing raceways in any Class III hazardous location.

Our discussion next month will cover Article 510 headed "Hazardous Locations—Specific" and go into "Commercial Garages."

Answers to Code test questions: (1. **T** Section 503-9-c) (2. **T** Section 503-9-b) (3. **F** Section 503-9-e) (4. **F** Section 503-15) (5. **T** Section 503-13-a) (6. **a** Section 503-6-a and b) (7. **c** Section 503-6-c) (8. **b** Section 503-7) (9. **b** Section 503-11 and 502-13-b) (10. **c** Sections 503-12 and 502-14-a-3).

New dynamometer

(Continued from page 49)

prevents centrifugal force from shifting the zero and thus throwing off the reading. The ruggedly constructed little mechanism is protected by shock absorbing internal stops against overloading caused by the initial starting surge of the motor.

Incentive plan

(Continued from page 46)

stalling a new circuit or repairing the existing circuit. Explaining to the customer what an overloaded

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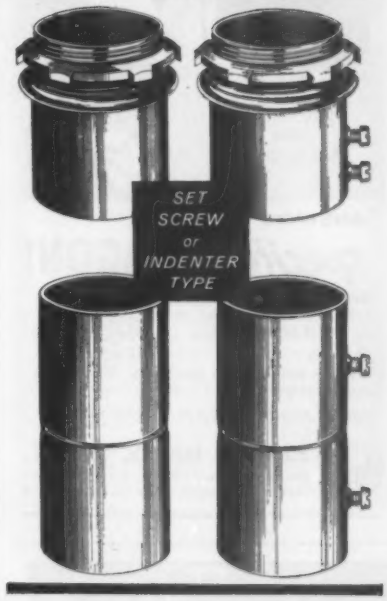

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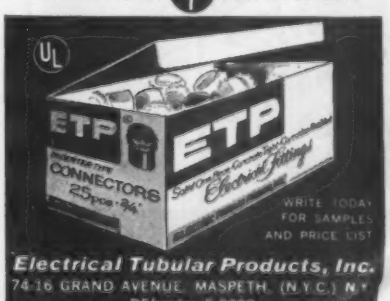

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circuit is, and the need for increased electric power to carry current appliances in use and those that may be bought in the future, our mechanic sold a 100-ampere heavy-up, a dryer circuit, and splitting the load up, sold three air-conditioner circuits, four light outlets, and three switches, thereby boosting a job from $150 to better than double. His bonus became $6.50 instead of $3.

In another case, when a five-ton air conditioner installation resulted in a heavy-up, our mechanic recommended additional wiring, appliance plugs, special switches, and light outlets. This was a large job for general air conditioning throughout the residence that brought a $1,700 sale. To our mechanic it meant a bonus of $6 since he raised the sale from its original $1,400.

In still another instance where a call came in from a customer for a larger fuse box, the mechanic reported difficult conditions that would be encountered in a heavy-up. A sale of $125 brought a bonus to our mechanic of $2.50.

We assist our mechanical personnel to make the sale they recommend. That is, when a customer is advised to have a heavy-up or additional wiring, we offer a special price to the customer to have the job carried out immediately while the mechanic is still present.

Even though it may mean overtime, our mechanics eagerly stay on a job beyond their eight-hour day. On an average they run over a 40-hour week by 20 to 24 hours. Their eight-hour day is paid at the hourly rate of $3.25. Weekly basic wages of $130 rise to anywhere from $150 to $200 with bonuses.

The incentive pay plan was introduced 2½ years ago when I felt that jobs were dragging out too long. The plan has increased job turnover per mechanic as each is anxious to work at maximum efficiency.

During the winter months when volume usually falls off, the incentive plan keeps us going with an adequate number of jobs. When severe snowstorms stop us, we still carry our mechanics on a 40-hour shop time. They sort materials, work in the warehouse, maintain equipment, and do other necessary chores.

As for training, we go over daily electrical problems as a group, discussing solutions and procedures in accordance with Code regulations. I draw diagrams on the blackboard as we picture what electrical and mechanical problems arise in the field, and how best to meet these problems.

We have meetings on salesmanship as we describe customer approach on the need for service equipment replacement, or what to say to the customer when defective or illegal wiring is found.

An incentive pay plan keeps the men constantly alert to electrical conditions. It makes them salesminded. I have no doubt that it helped in selling the 400 electrical heating jobs we carried out last year.

Versatility in lighting

(Continued from page 45)

when he planned the wiring and the control panel.

Arkansas school boards, with limited budgets, are indifferent at this time to air conditioning for new schools, especially elementary schools. However, according to Mr. Houston, all are interested in better lighting and exhaust fans.

At night, the Perrin Elementary School is a brilliant sight when lighted for special events. It advertises the skill of the electrical contractor. In a few months of operation, it already has won more school contract work for the Houston firm.

For this school, built with well considered safety features, underground wiring service is used exclusively. The electrical wiring system had to match safety features with the fireproof brick-and-glass construction. It also had to provide service for potential future classrooms, which were well considered in plans of architects.

Another exceptional school lighting job, which represented a $35,000 contract for Mr. Houston, is the Walnut Ridge High School, in the northern part of the state. Here fluorescent lighting is used, to the contractor's personal satisfaction. Mr. Houston declares that fluorescent lighting is better for children's eyes, and is 50 per cent cheaper to operate.

When he can influence school boards and architects to specify fluorescent lighting, he feels that he is constructing the most satisfactory type of lighting for modern schools.

In the Walnut Ridge School, special difficulties faced the contractor. The building is concrete, with a pre-cast concrete roof. Although a web of channels for wiring was cast in the roof, a diamond-point drill had to be used

for installing the outlet box and the continuous rows of fluorescent strips, eight rows to the room. These fixtures provide an illumination of 50 footcandles.

In his electrical contract work for schools, now reaching to all parts of the state, Mr. Houston employs labor-saving power tools that conserve manpower. With only four or five men at work, using power tools, he completes his contract profitably for himself and satisfactorily for his customer.

Card index system

(Continued from page 43)

so and is that much more incentive to use whatever caution is necessary to account for what they use.

The Edenfield warehouse has a separately partitioned area in which the work tools, when not in use, are kept, so there is no trouble at all to find a tool if it is in the warehouse. The wiring fixtures are stored in hundreds of bins or, if too bulky for bin storage, they are kept in well classified sections. The bins and storage areas are kept fully stocked with the items to which they are devoted.

The Edenfield company handles 1,000 or more construction jobs a year and whenever a new contract is signed its warehouse already has in stock practically everything needed for it and has it ready to load on the work trailer. If anything extra has to be purchased for a job it can be secured immediately from a supplier in the same city.

Mr. Barnett, being a full time warehouse manager, keeps a continuing check on all supply bins and the card index record. "I make regular checks on my card record," he says. "It enables me to learn if every work tool needed for the next contract is going to be ready when it is signed."

The index, of course, shows whether all the ladders, benders, or any other tools are in use on some present jobs, and whether a new tool needs to be purchased for the job at hand.

All identical tools have numbers that run in consecutive order. For example, if the company possesses five pipe threaders they might be numbered 71, 72, 73, 74, and 75. Thus all the pipe threader cards are together in the card drawer. If the warehouse checker is looking for a specific threader all he has to do is check each consecutive card until the right one is spotted.

Mr. Barnett's periodic check of these cards keeps every work tool in focus and if it drops out of sight the record shows, at least, where it ought to be.

The four brothers, who operate Edenfield Electric, Inc., are Ray Edenfield, president; J. V. Edenfield, vice-president; Ed Edenfield, Jr., vice-president and assistant secretary-treasurer; and E. P. Edenfield, secretary-treasurer. The company is the largest of its kind in the Nashville area and one of the largest electrical contracting firms in the South.

The card index system it uses is easily adaptable to almost any size contracting operation.

Test homes promote

(Continued from page 42)

ing temperature difference was also only about two to three degrees.

With such a slight temperature variance, it was obvious occupants would feel no discomfort sitting next to an outside wall because cold drafts had been completely eliminated.

The effect of insulating basement walls to reduce heat energy was studied in a comparison test using an uninsulated laundry room and an insulated recreation room. When both rooms were heated to 65 F during a three-week period, the insulated room showed a 35 per cent lower heat consumption.

The advantages of using insulating sheathing was shown in tests which measured the value of this material as an efficient thermal barrier. Thermocouples on the cold side of the wall showed a 4.5-degree lower temperature behind the insulating sheathing, proving less heat transfer and greater insulating value than a normal wood construction.

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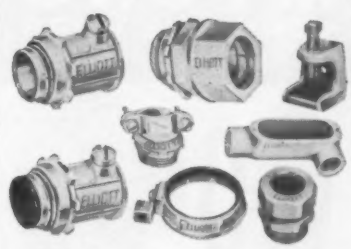

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actual family of four occupied one of the homes. Although no attempt was made to operate the two test houses under identical conditions this past winter, results were practically the same in total energy consumption.

Cooperating in the test project are Minneapolis-Honeywell Regulater Co., Andersen Corp., Edwin L. Wiegand Co., and Northern States Power Co.

Cable tracer

(Continued from page 38)

The ammeter needle should then swing all the way over to the triangular mark. If it does not coincide exactly with this reference mark, a rheostat on the bottom of the instrument case can be adjusted until it does to compensate for changes that may have occurred in the battery voltage.

If the line being traced has an open, the meter needle will not move at all and when the indicator button is depressed the "O" lamp will light. Conversely, if the line in question has a short the meter needle will swing past all the lamp circuits and come to rest over the triangular mark, thus positively identifying a shorted line.

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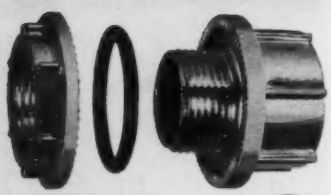

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It requires about five minutes to instruct an electrician on how to use the instrument. I believe you will find it helpful to explain to him just how the unit functions internally. Knowing that there is a meter movement inside the cable tracer, he will be better able to use it intelligently and to give it the care such an instrument deserves.

When working with one side of the tracer receptacle grounded it was found much easier to use test leads with alligator clips in both sides of the receptacle; using one to ground the instrument and the other to connect onto the wire being traced, rather than trying to insert each individual wire into the receptacle.

If you don't use the test clip, it is tempting to just hold the wire in contact with the receptacle terminal rather than locking it in. Should poor contact be made, and it can happen if operated this way, erroneous readings will result.

When used as directed, the cable tracer performed flawlessly. The case is made of a tough plastic material and fits comfortably into the hand. Battery replacement is accomplished by loosening a couple of screws and removing the back of the case.

Of course, battery polarity must be observed, since the meter would attempt to read down scale if it were reversed. Damage might result. The battery used is an E-9 Everyready mercury cell. This type of battery gives relatively constant output over a large portion of its life.

Lamps can also be replaced while the back of the instrument is removed, though this should seldom be required. Reliable readings over a long period of time are the result of using it as directed.

Quite frankly, I like this new instrument. If you do work requiring cable tracing it should soon pay for itself.

New switchboard

(Continued from page 37)

been replaced with 42-circuit, 100-ampere panels with 20-ampere breakers for the 110/220-volt, three-phase, four-wire system.

There are now ten of the new 100-ampere panels, two to each floor from the ninth through the 13th, and two in the basement. One 200-ampere panel is now used to service the kitchen area. Feeders to the panels were run through rigid conduit ranging in size from 1¼ inches to 3½ inches.

Pointing out the danger of old, wornout wiring in some of the older type office buildings, Roy Gay reported a number of dangerous discoveries while on the job.

Some of the LB condulets were hidden behind wall baseboards, and the bottom half of the condulets found imbedded in concrete. Much of the 600-volt, No. 2 wire with single braid rubber cover was found with the insulation rotting off. This was all replaced with No. 2 RH wire.

A number of wire joints were also found that were improperly spliced, sometimes just hooked together and often not soldered. Long runs of conduit without pull boxes had to be modified.

Plans for the future call for making other changes in the building, which will consist of checking and replacing the old wiring and installing new lighting panels from the basement through the eighth floors.

Washington report

(Continued from page 8)

subsidized by the federal government. There are numerous other construction programs, like public housing, that involve federal money.

The loans can be used for new buildings, new machinery and equipment, and new working capital. For further details, those interested should write the Small Business Administration, Washington 25, D. C.

Discrimination forbidden on government contracts

THE PRESIDENT'S COMMITTEE on Equal Employment Opportunity last month ruled that government contractors must sign anti-discrimination clauses and require first tier contractors to do likewise.

Within 30 days after receiving a contract, contractors must file compliance reports. They must furnish information on local union practices and whether unions will supply information on their practices. In advertising for employees, the contractors must state that they do not discriminate. Anti-discrimination posters must be displayed at work places.

Contractors who violate the order may be blacklisted and have their contracts canceled. Only persuasion may be used on unions that fail to comply.

Exempt are contracts under $10,000. President Kennedy signed the order putting the rule into effect.

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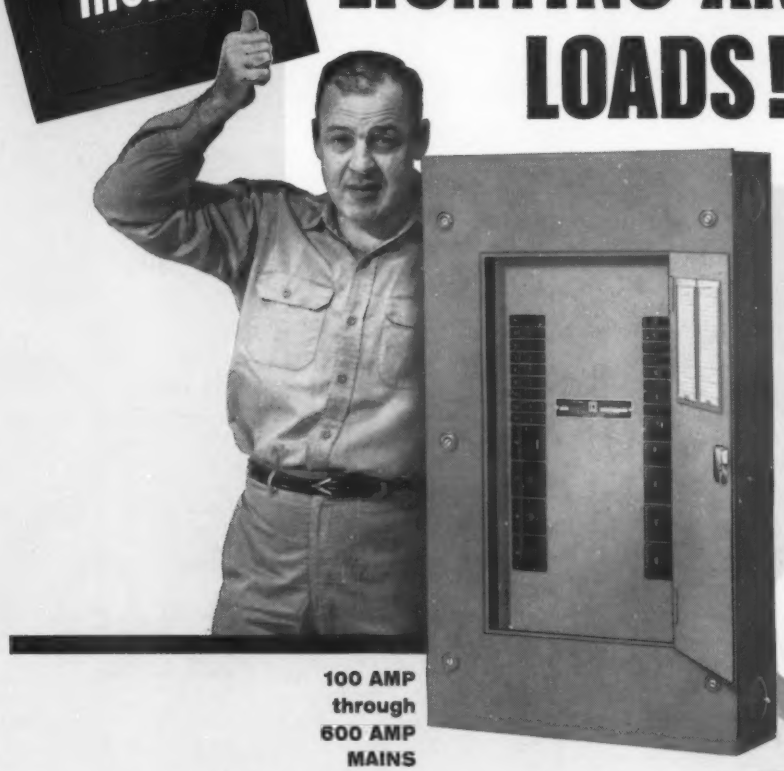

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